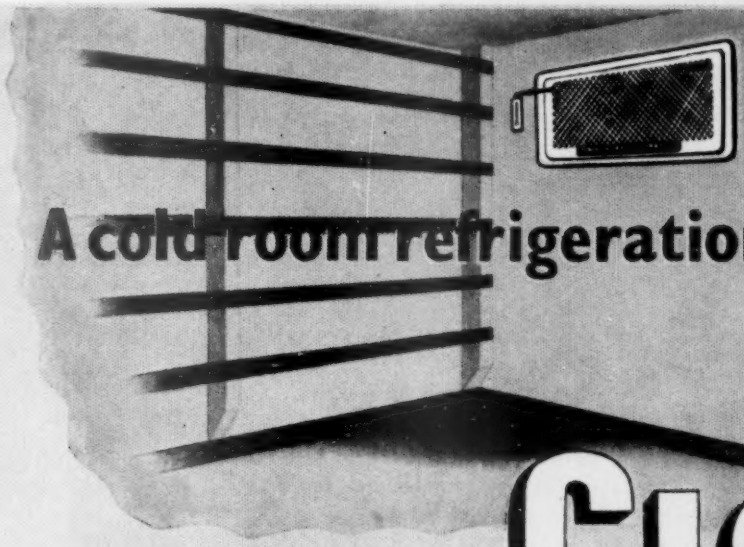
MODERN REFRIGERATION AND AIR CONTROL

Vol. 63 No. 747 JUNE, 1960 Price 2s. 6d. monthly



A cold-room refrigeration plant

complete for only £180

Only TEMKON Packaged Units make this possible!

They are completely self-contained – are delivered factory wired and piped for easy, low-cost installation – supplied with installation kit.

★ Low temperature range –15°F to +38°F. ★ Medium temperature range 36°F to 60°F.

★ 1½ Horse power. ★ Hermetically sealed – refrigerant charged for life.

★ Suitable for HOTELS—SHOPS—CATERING ESTABLISHMENTS—SUPERMARKETS—MOBILE APPLICATIONS—ETC.

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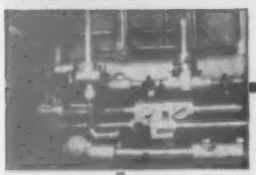
BURLINGTON ROAD FULHAM LONDON SW6 Phone: RENOWN 5813 (P.B.X.) Cables: TEMTUR LONDON

Largest producer of packaged air cooling plants outside the U.S.A.

P.4390

SMITHS

have many strings to their bow...



Our great achievements in designing and building many of the largest and most up-to-date cold stores in the country have taken us right to the forefront of the industry. But the design and construction of large cold stores is not our only activity. We are also specialists in all the "built-in" applications of insulation, factory insulation, and pipe insulation and boiler covering; have been for years! No job has ever proved too big or too difficult for Smiths, so if you have a project in mind of any sort involving insulation or cold storage, why not consult our design engineers first? There will be no cost or obligation, and remember, we can handle the job completely, right from the original drawings.

- **Cold Store design and construction**
- **"Built-in" applications of insulation**
- **Factory insulation**
- **Pipe insulation and Boiler Covering**

Smiths Insulations Ltd.

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Super-Salesman G.S.91
Looks the goods...
Sells the goods!

Here is a Super Salesman in shining white and stainless steel, a constant invitation to every customer to buy from its fine display.

Study the specification, look at the capacity, you will see that the LEC sells on merit—a must for modern marketing.

- **Integral slide-away night cover**
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- **Sealed Motor Compressor. Five Year Warranty**
- **High-bake Enamel**
- **Full Length Impulse Buyer Shelf**

DIMENSIONS:
Length ... 72"
Width ... 30"
Height ... 41½"

CAPACITY:
(Net) 10.7 cu. ft.
(Gross) 11.4 cu.ft.

Price: £230.10.0 (includes £10.10 minimum installation and 12 months service fee).

GS.D 71. Similar unit, but with 2 compartments. Capacity 7.1 cu. ft. Price: £140.10 (includes £7 minimum installation and 12 months service fee).

Lec

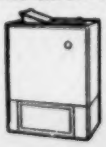
RC 6 Refrigerated Counter £199.10 *

S 13 Service Cab. £111 *

CF 30 Conservator 12 c.f. £181.10 *

CD 35 Dual Temp. Display £119 *

C9 Conservator 3c.f. £74 *



* Includes minimum installation and 12 months service fee.

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M.R.20

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MINIVEIL

AIR CURTAIN UNIT

FOR OPEN COLD STORE DOORS

For efficient Cold Storage operation

The Minikay System keeps new insulation permanently dry and dries out existing wet insulation.

The Minikay System eliminates the heavy cost of re-insulation.

The Minikay System extends the life of your cold store to that of normal buildings.

Cold Storage insulation is extremely valuable—protect it with Minikay.

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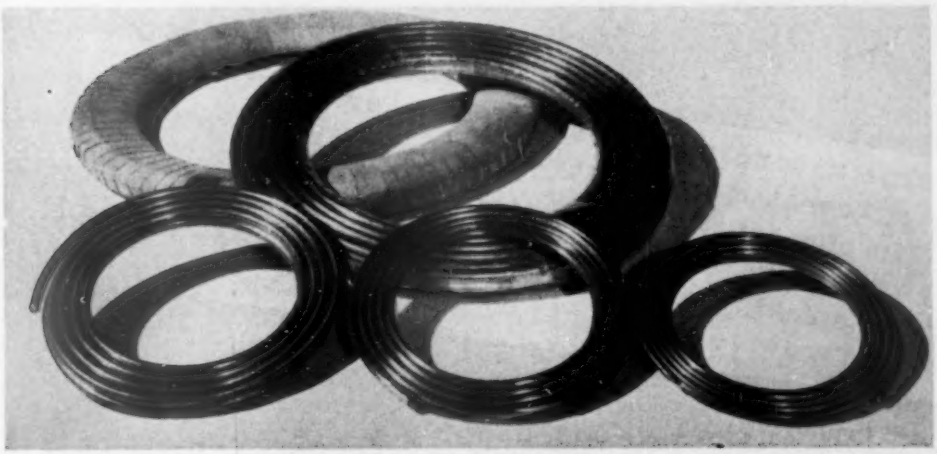
The tubing is coiled in double pancake coils in standard 20 ft., 50 ft. and 100 ft. lengths—or supplied in straight lengths—and when required can also be tinned on the outside.

Yorkshire Imperial also manufacture restrictor and bulb-and-capillary tubing—and a range of special "Yorkshire" Fittings for refrigeration work.



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The recording spectrophotometer and integrator in routine use in our control laboratories permits exact numerical measurement, using internationally standardised lighting, and ensures colour continuity.

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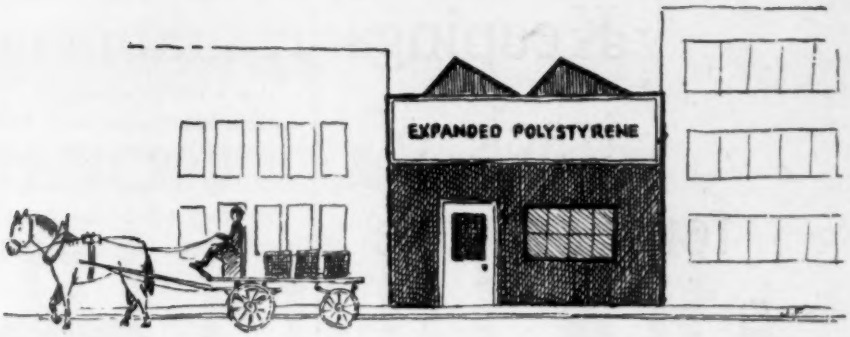
Paint Specialists since 1840



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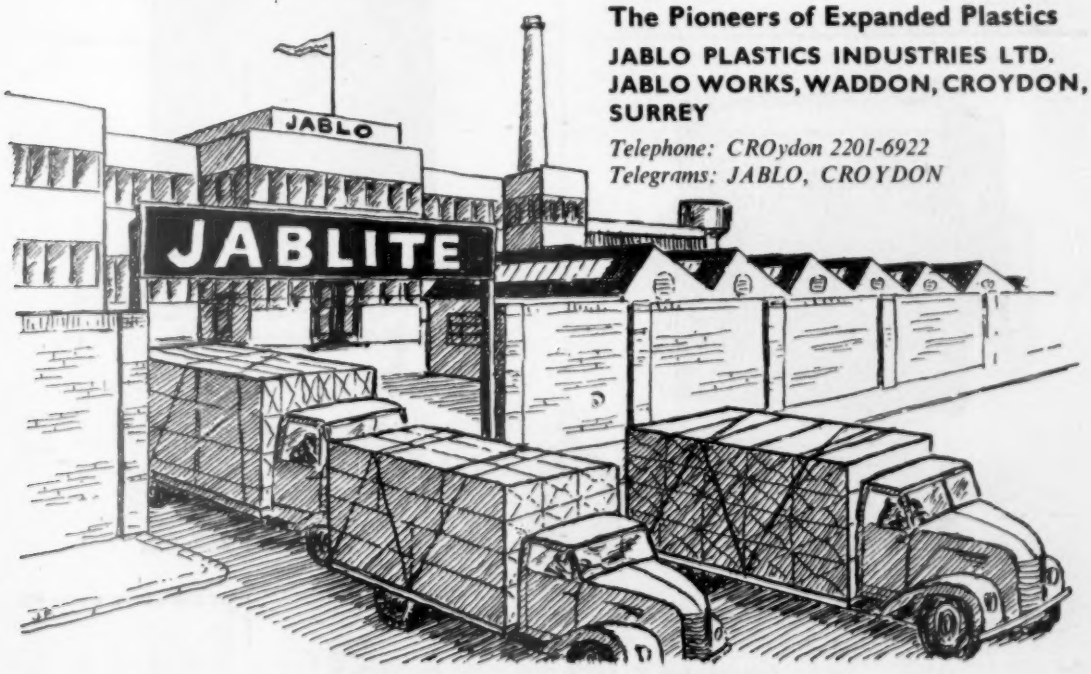
who are still asking for expanded polystyrene while so MANY are specifying JABLITE, you will join them after your first trial with Jablite, because of the unrivalled advantages which Jablite offers.

* Consistency of density and maximum insulation values.
* The only expanded polystyrene obtainable promptly against orders in largest volume of blocks and boards in all sizes up to 12′ x 4′ x 13″, at the RIGHT PRICE.
* The largest and most versatile capacity of foamed plastics in Europe, supported by fifteen years continuous experience.
* You are relieved of storage problems. We supply as and when required at shortest notice . . . and accept your offcuts.



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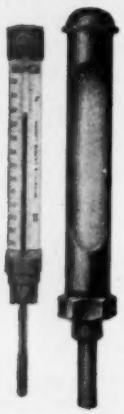
—is a matter of degree. Temperature indicators recorders or controllers, Negretti & Zambra make them all do the job for you—exactly. You can be sure, too, that their fine accuracy will be matched by an inherent robustness: long life is built in.

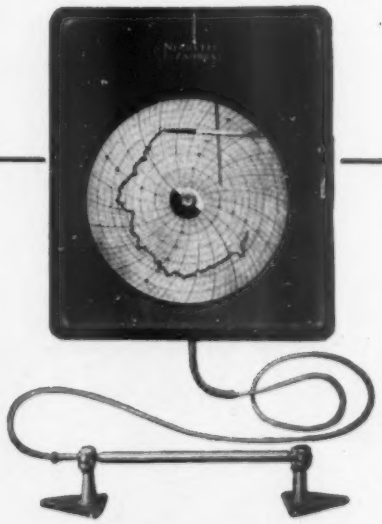
Porcelain Thermometer for Cold Stores

Metal Scale Thermometer for Refrigerated Chambers



Brine Pipe Thermometers

Dial Thermometer. Standard Type for Cold Stores



"Mersteel" Temperature Recorders. Standard Type for Cold Stores

Multi-point Resistance Thermometer

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UNION CARBIDE MOLECULAR SIEVES

UNION CARBIDE Molecular Sieves dry refrigerants more efficiently than any other desiccants. PLUS these advantages:—

SUPERIOR CAPACITY AT LOW WATER CONCENTRATIONS
SUPERIOR WATER CAPACITY MAINTAINED IN THE PRESENCE OF OIL
SUPERIOR CAPACITY FOR WATER AT ELEVATED TEMPERATURES
SUPERIOR ADSORPTION CAPACITY REDUCES DRYER SIZE

UNION CARBIDE Molecular Sieves re-establish the whole economy of drying refrigerants on a new basis and offer profitable opportunities for development. Detailed information is available on modern desiccation techniques, using Molecular Sieves.

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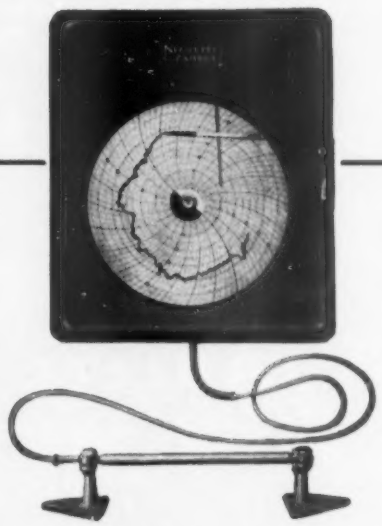
Multi-point Resistance Thermometer



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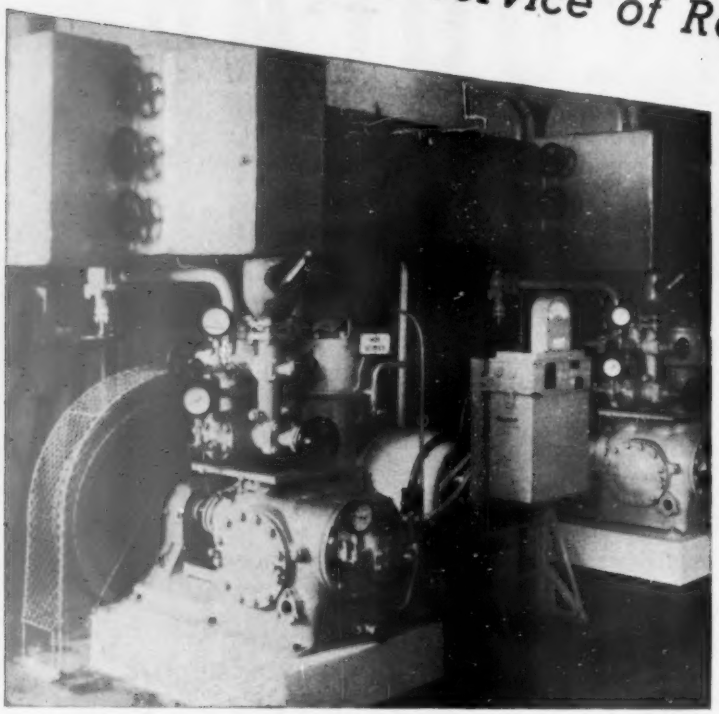
From Insulation to Installation

A Complete Service of Refrigeration



★ **COMPRESSORS**
Single or two stage

★ **CONDENSERS**
Shell and Tube or Evaporative

★ **INTERCOOLERS**

★ **EVAPORATORS**
Plain pipe
Finned pipe
Shell and Tube
Submerged type
Flooded, etc.

★ **LIQUID AMMONIA PUMPS**

★ **INSULATION AND COLD ROOM DOORS**
for all Cold Storage and low temperature work

At some time you will probably have experienced the bother of buying plant piecemeal in which case you will know the extra worry which this can cause on top of everything else.

William Douglas & Sons Limited are in the position of being able to provide both plant and insulation themselves with their own staff on both sides. Behind this they have a solid foundation of experience in both kinds of work and above all the experience of putting the two together.

Why not save yourself that extra worry by asking Douglas to give you a complete *Service of Refrigeration*?

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- ***Specially designed for transport —not adapted from static plant.***
- ***One-piece, compact units.***
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- ***Cooling or heating at touch of switch.***
- ***Use least possible cargo space.***

A full range of Thermo King units are available for all types and sizes of vehicles.
For further information about the above and other Thermo King units, kindly write to the address below.

HAWKER SIDDELEY** (HAMBLE) **LTD.
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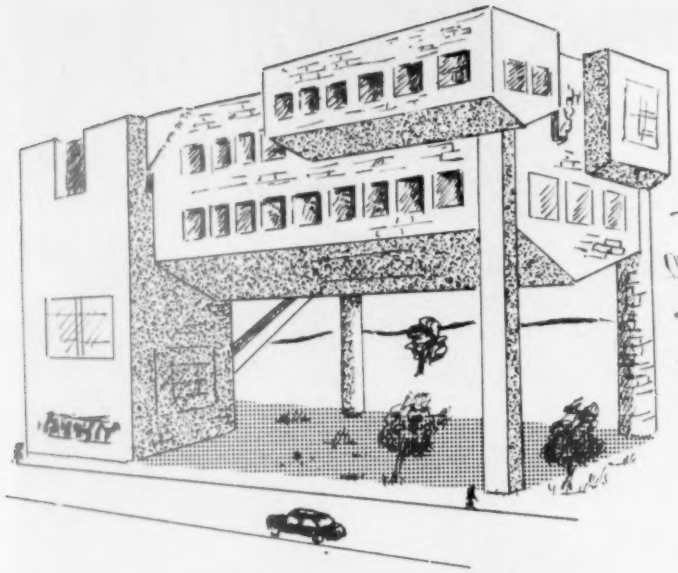

non-
standard...

. . . and custom made Prototypes for industry

This old-established Company is equipped for anything of a non-standard nature for the rugged individualistic user, and we specialise in producing prototypes.

The handmade job is our delight and the Mitcham Works will be delighted to take on any problem you may have.

Special Frozen Food Displays—odd lengths, shapes, angles ; odd size Cold Rooms and Cabinets ; Milk Coolers ready for equipment ; Stacking equipment for Frozen Food in storage and transport ; special kinds of insulated Display or Sales Vehicles—in fact anything that proves a nuisance in modern line production, but which manufacturers wish to supply to valued clients, can be made by

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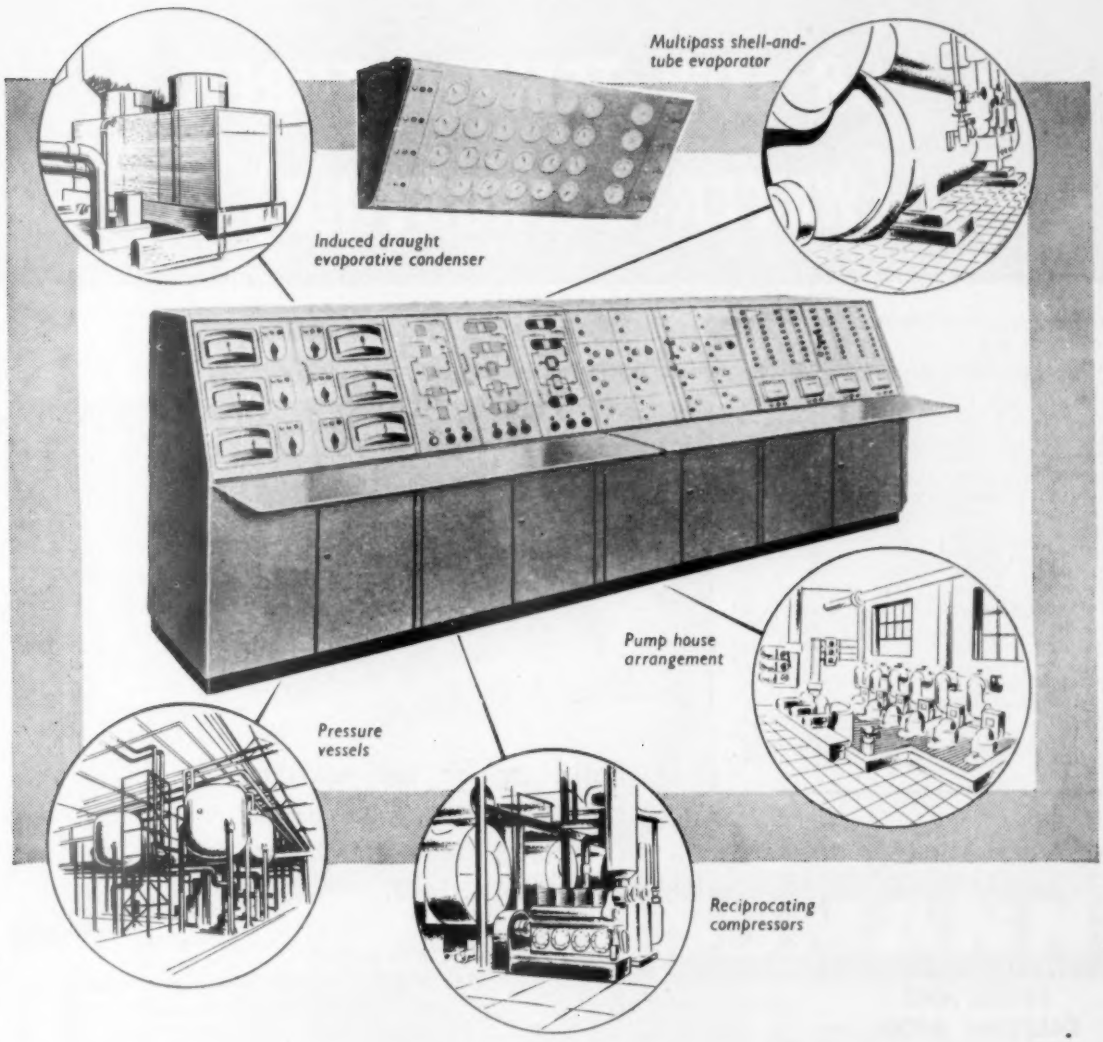
UDEC REFRIGERATION CONTROL

Illustrated is a four line automatic control system,

and typical units it can handle

—an example of UDEC Refrigeration Engineering.



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U. D. ENGINEERING COMPANY LTD

REFRIGERATION ENGINEERS

ABBEY WORKS · CUMBERLAND AVE · PARK ROYAL · LONDON · N.W.10

Telephone: ELGar 6581

UDE/52a

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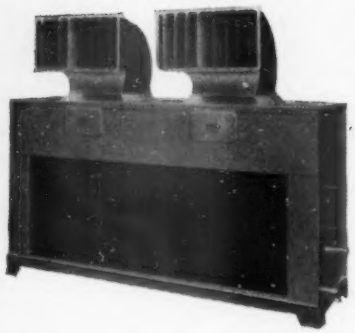
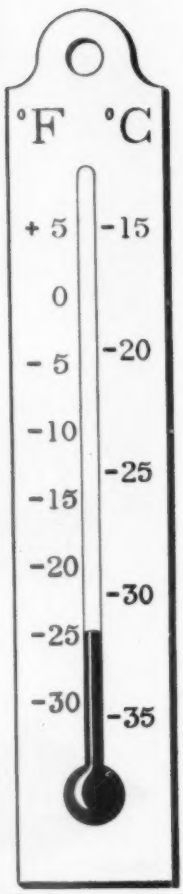
HEAVY DUTY PRODUCT COOLERS FOR LOW TEMPERATURES (WATER DEFROSTING)

MODEL	B.T.U. /HR.	OVERALL DIMENSIONS		
	10°F T.D.	Length	Height	Depth
RW180	18,000	62″	70″	31¼″
RW240	24,000	62″	70″	31¼″
RW300	30,000	79″	74″	31¼″
RW360	36,000	93″	74″	31¼″
RW400	40,000	79″	74″	31¼″
RW480	48,000	93″	74″	31¼″
RW540	54,000	106″	86″	34″
RW600	60,000	114″	86″	34″
RW660	66,000	114″	90″	34″
RW720	72,000	106″	86″	34″
RW780	78,000	114″	86″	34″
RW820	82,000	114″	98″	34″
RW880	88,000	114″	90″	34″
RW960	96,000	121″	102″	34″
RW1080	108,000	114″	98″	34″
RW1280	128,000	121″	102″	34″
RW1360	136,000	144″	110″	34″
RW1800	180,000	144″	110″	34″





COILS OF ¾″ OD SEAMLESS COPPER TUBING. ALUMINIUM FINS MECHANICALLY BONDED AT 6 PER 1″. ANGLE IRON FRAMEWORK GALVANISED AFTER MANUFACTURE. FULLY GUARANTEED.

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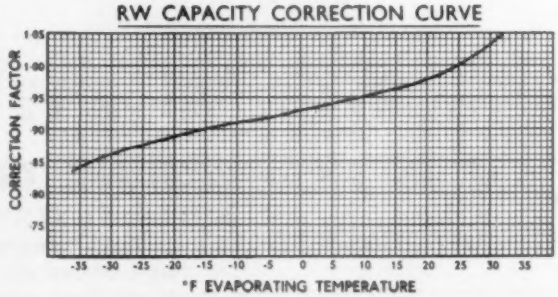
RW CAPACITY CORRECTION CURVE



New! HUSSMANN CASCADE MERCHANDISING *for MEATS!*

THE SUPERIORITY of Cascade merchandising is already well proven and accepted. Now all its many benefits have been incorporated into this new addition to the Cascade range, for the self selection of meats.

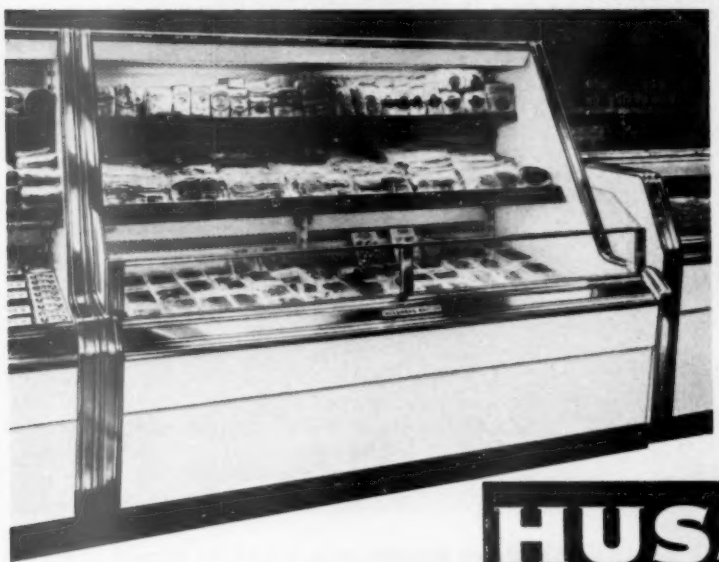
Featuring large, even-temperature, open display shelves, specially designed to encourage the free flow of merchandise from shelf to shopping basket, the new HUSSMANN-Cascade has shelf temperatures adjustable for both imported and home-killed meats.

This proven system of advanced merchandising gets those extra sales that mean extra profit for you.

How Hussmann 'air-cascade refrigeration works

Cold air flows from the back of the shelves and cascades down in front of the display to form an invisible cooling blanket that keeps warm air out of the case.

The new Hussmann Cascade for meat incorporates all these advanced features:



- *3 spacious refrigerated shelves—adjustable for eye catching display.*
- *Large additional top display.*
- *Bigger selling area per square foot of floor space—more display per linear foot.*
- *Shelves wide open—no barrier between customer and merchandise.*
- *Constant shelf temperature with exclusive HUSSMANN 'air-cascade' refrigeration.*
- *Brilliant lighting — built-in ticket rails.*

HUSSMANN

meat CASCADE *gets extra sales*

To **HUSSMANN BRITISH REFRIGERATION LTD**
242 Tottenham Court Road, London W.1
Please supply me with further details of Hussmann meat refrigerated display cases

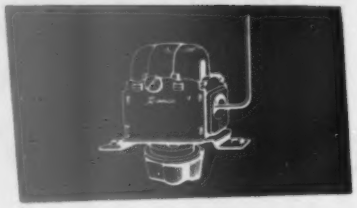
NAME .....

ADDRESS .....

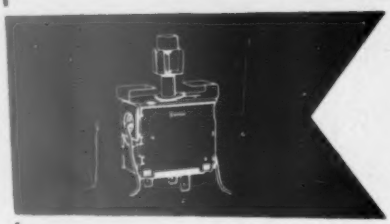
..... TRADE .....

M.R.6

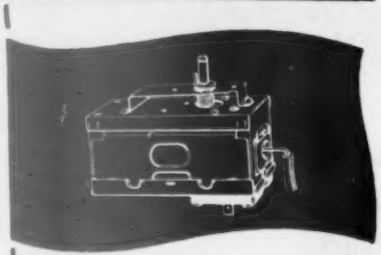
Ranco signals S·U·C·C·E·S·S



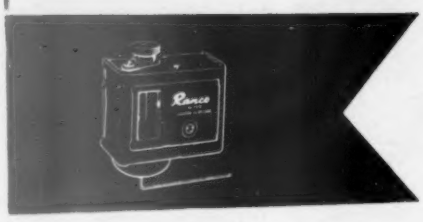
Ranco 'A' series provides a control suitable for all light and medium duty applications. The control can be made available with a single or double throw switch with various temperature ranges and differentials and in many other forms including one for operating a single or alarm circuit.



Inexpensive defrosting of domestic refrigerators is made available with the Ranco Push Button 'F' control. Combining the normal temperature control with push button defrosting the 'F' automatically re-starts the compressor after the evaporator has defrosted—returning the push button to the normal position.



Ranco 'E' series controls provide for automatic defrost of refrigerators. The defrost cycle is started at a fixed time each day and stopped at a fixed temperature or after a "time safe" period which ever occurs earliest. Available for hot gas or electric heater defrost systems. Ranco 'E' controls are used in conjunction with the normal thermostat.



Ranco 'O' series temperature controls provide a single-pole snap acting switch either closing the circuit on a rise and opening the circuit on a fall of temperature, or the reserve. The differential screw changes the CUT-OUT only on standard cooling controls: the same adjustment on standard heating control changes the CUT-IN. Graduated visible scales indicate range and differential settings.

For commercial refrigerator applications Ranco supply a very full range of pressure operated controls, in addition to the temperature operated series. These are offered in Low pressure, High pressure and dual high-low pressure ranges, and are available with various operating ranges and differentials.

The Ranco Research team is available to assist in the development of any special project or application.

For further information please write to:—

Ranco Limited,
Technical Sales Division,
54, Cheam Common Road,
Worcester Park, Surrey.
Telephone: Derwent 7785 (3 lines)
Telex: 25346

Ranco LTD
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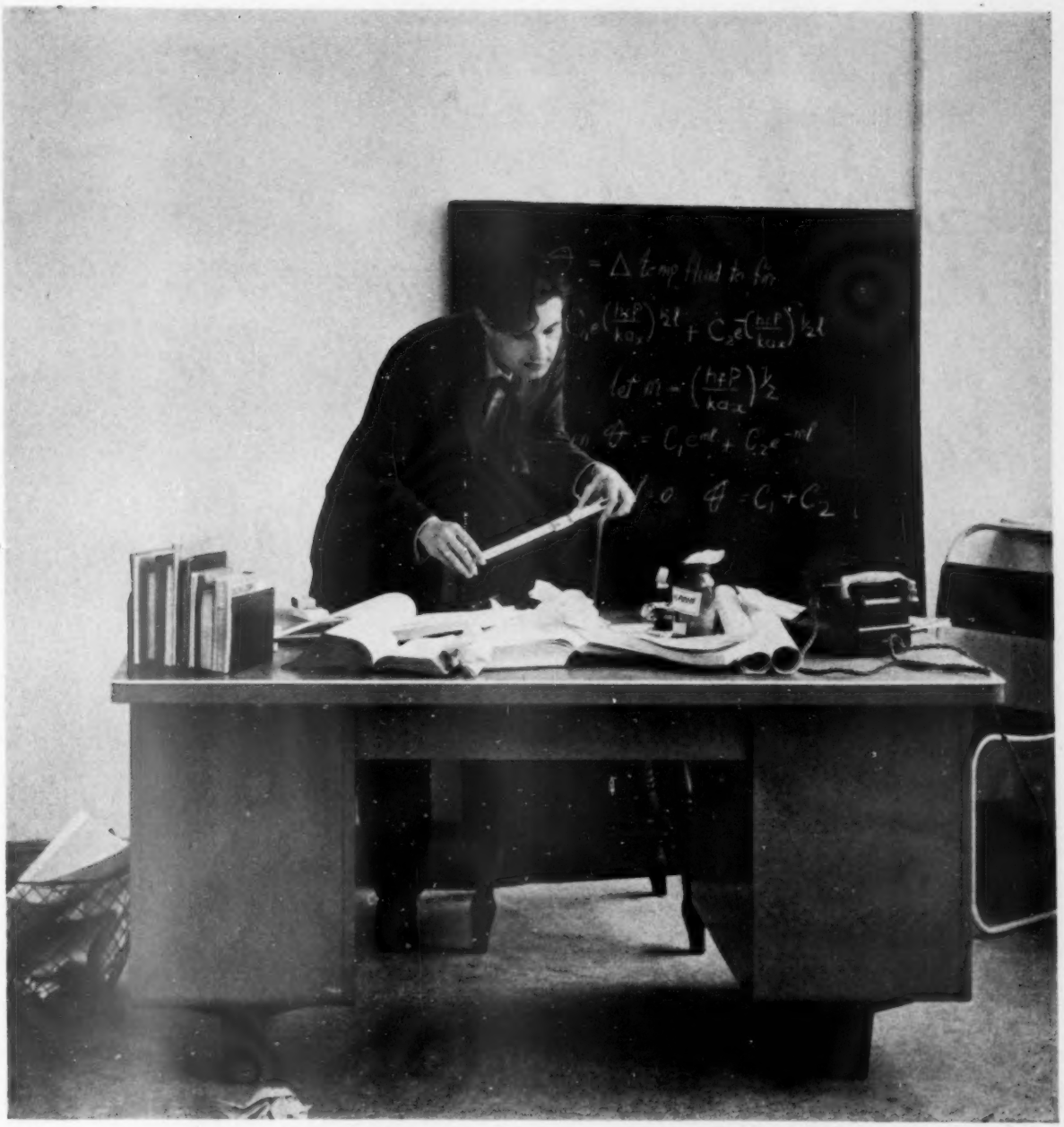
SCOTLAND

Biggest name in small controls for refrigeration heating & air conditioning



refrigeration engineers have headaches . . .

you must have had the same problems,
wanted . . a large refrigeration load . .
accessibility for servicing etc.
you go home you dream of L.M.T.D's . . low
heat transfers . . costs ! you wake up . .
what have you got?
a space as big as a matchbox to fit it all in!
Ah well, pick up the slide rule . . start again.

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The Greatest advance in Refrigerated Self Service Display!

The Self Service Cases which anticipate the needs of tomorrow

Write for full information or call in and see them at our works in Hornsey

OUTSTANDING FEATURES

NEW Refrigeration Technique
Keeps food temptingly fresh, cuts operating costs.

NEW Visual Appeal
Extra capacity ensures maximum stock on display. Full Product Visibility. Easy Shopping Angle.

NEW Produce Perfection
Through precise temperature control with automatic defrosting.

NEW Styling and Colour Schemes
With warmed reach-in rail and ample room.

WRITE NOW for full Information

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AMERICAN DESIGNS
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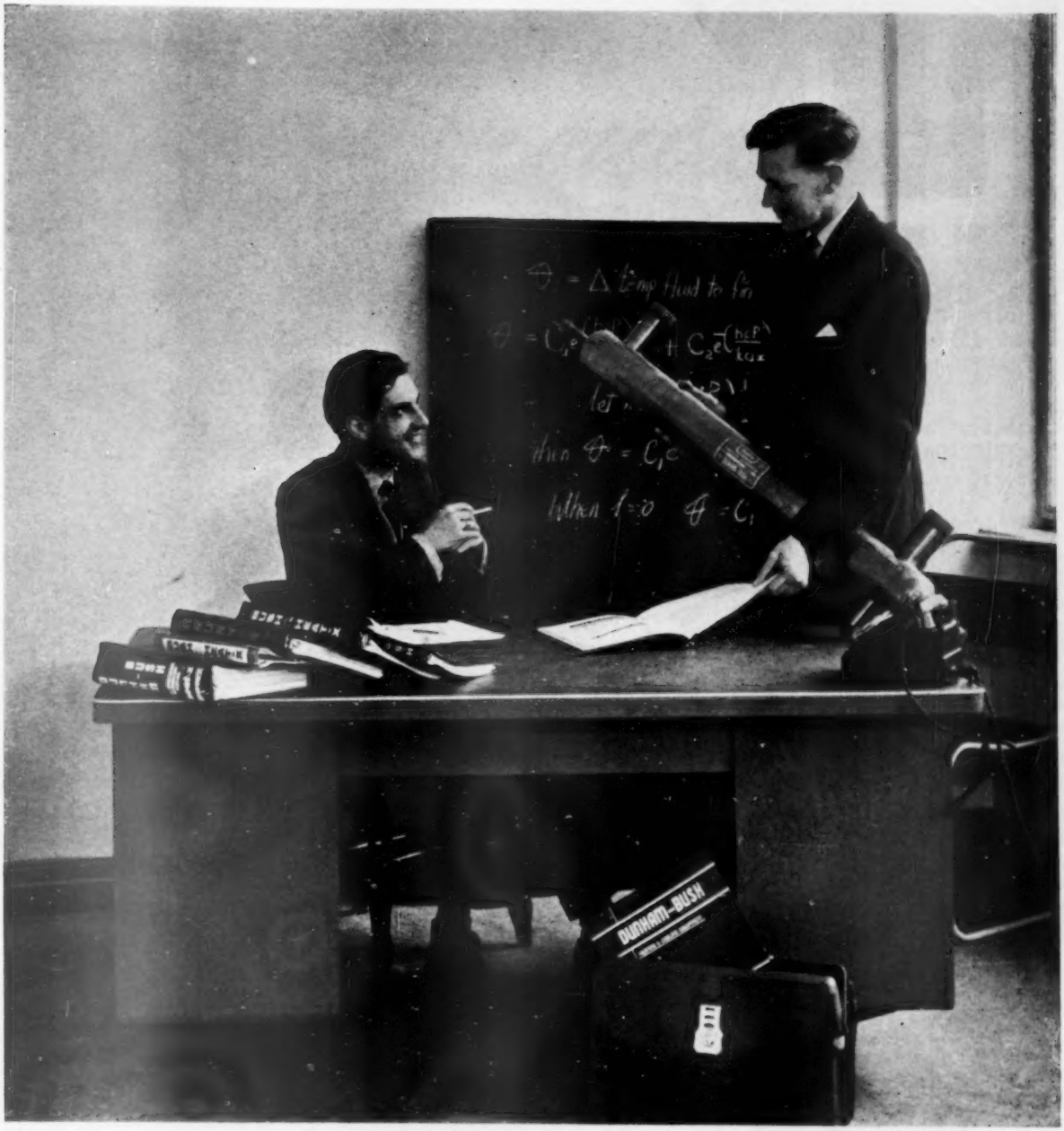

. . . not any more

all I did was to phone COSHAM 70161 . . a representative called, and there were all the answers . . inner-fin . . all non-ferrous construction! incredibly small components . . now I can really get all that equipment in that matchbox. All I do now is look in the Dunham-Bush catalogue . . it answers all my problems.

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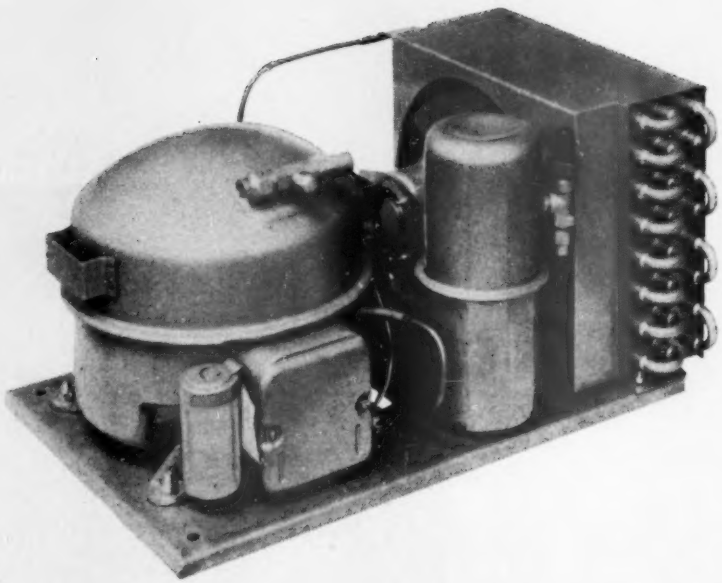
DB/36



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Household and commercial compressors and condensing units 1/14 to 1 HP.
Household and commercial systems

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Write NOW for full particulars, or consult our Technical Insulation Department at Slough on problems of protection, adhesion and finishing.

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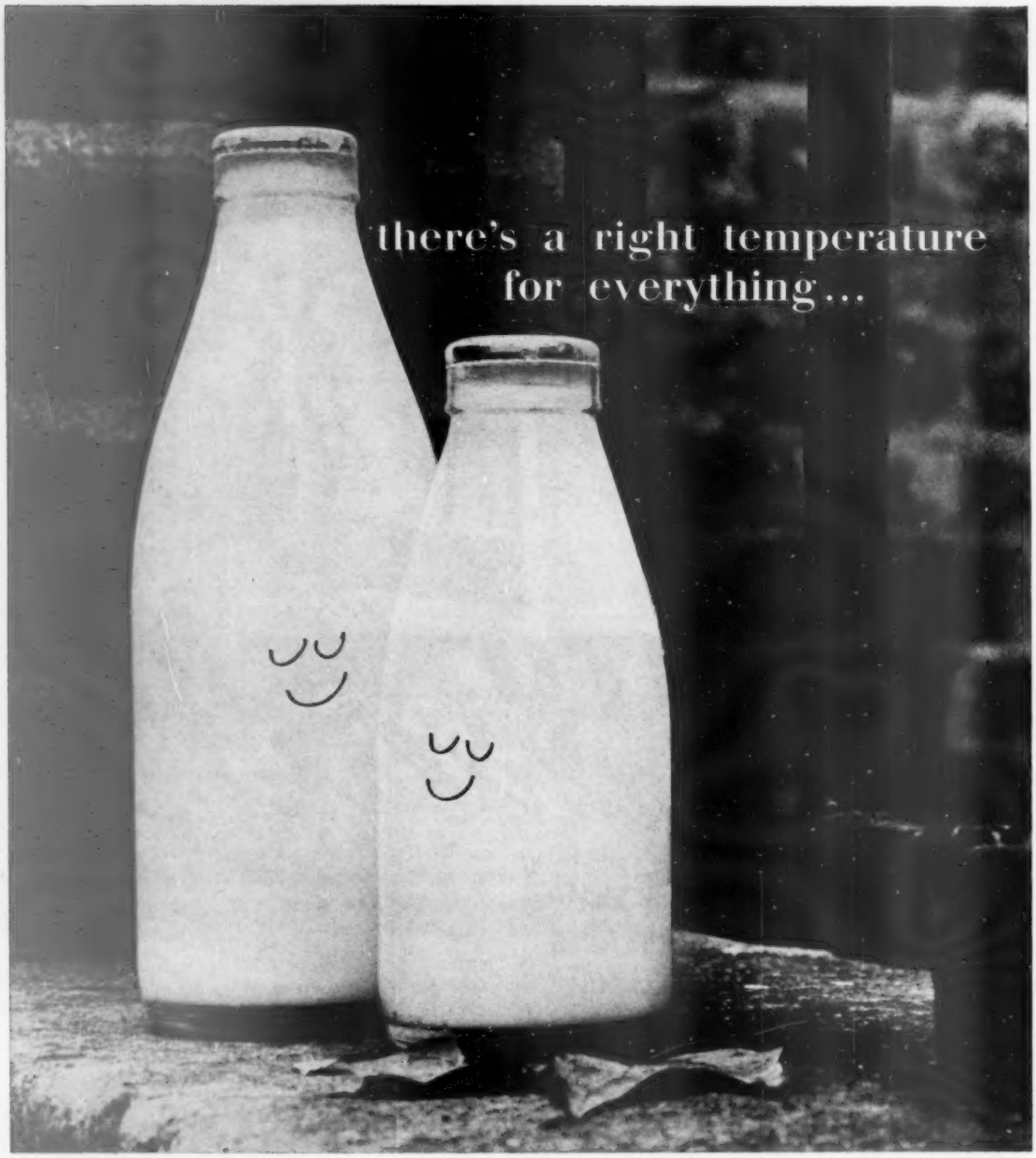

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Refrigeration Controls by Teddington for milk—for everything—everywhere.

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Sunbury-on-Thames, Middlesex

Branch Office & Trade Counters at:
31 Quay Street, Manchester. Tel: Blackfriars 2120
255 St. Vincent Street, Glasgow. Tel: Central 3933
London Stockists: H.R.P. Limited

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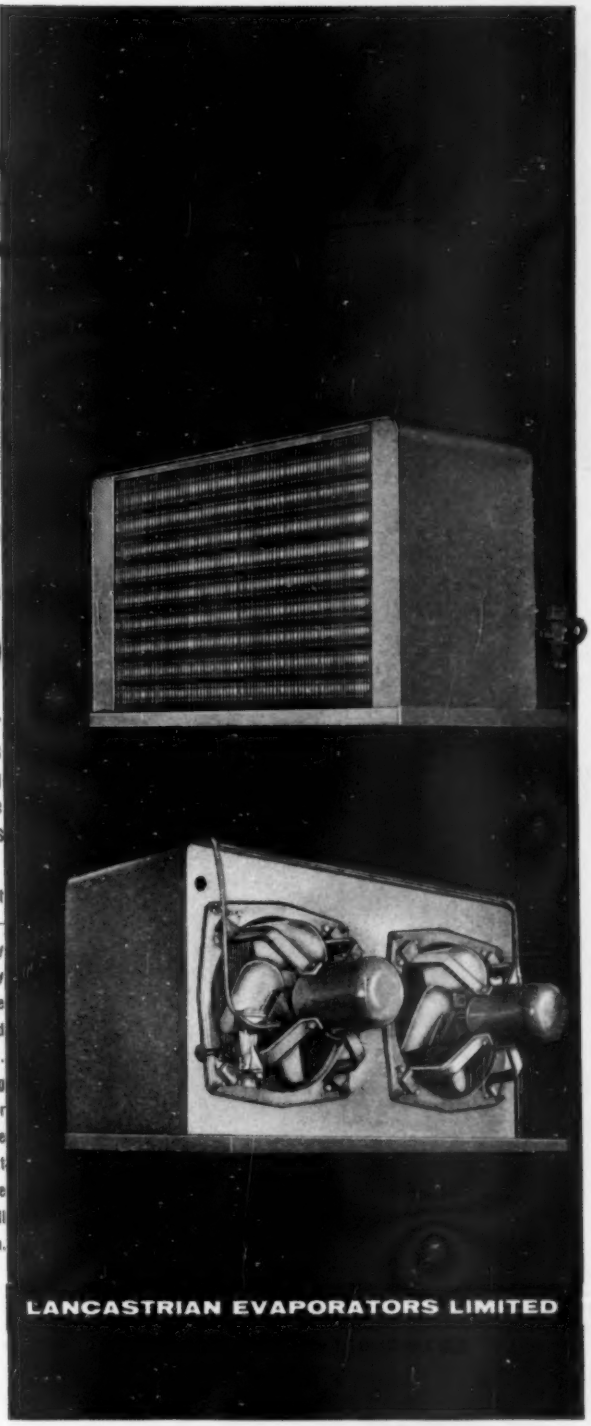
TR 58

Lanca

UNIT TYPE COOLERS



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Cold rooms
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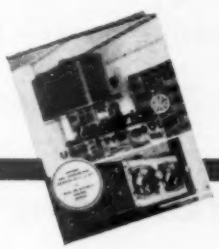
Designed for continuous cooling at temperature ranges of 0° to 55°F — and soundly constructed from heavy gauge aluminium sheet chemically treated against corrosion — these Units have an attractive and hardwearing finish. With coil bank of tinned copper tubing expanded into light aluminium fins for maximum heat transfer — and available with or without Electric Defrost system — Lancastrian Unit Type Coolers are simple to install and economical to run.



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Eye-appeal ---
Buy appeal

. . . and the perfect working partner for your unit!

Secura for beauty! The sculptured lines and gleaming finish of this counter make an instant appeal to the modern food retailer — and his customers. Its plastic-dipped shelving is a major contribution to eye-appeal and hygiene. *Secura* for duty! Robust construction, faultless insulation . . . making use of the full efficiency built in the refrigeration plant. It's the very working partner for your unit. Yet with all its features for appeal and performance the *Secura* is remarkably low in cost. Write or phone for illustrated literature right away.

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. . . making it easy for you to

team-up your unit with Secura's many advantages

Secura

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. . . there it is again. . . . Sound of sick vacuum-forming machine. Soon it will stop altogether. . . . Don't wait for that! Install a Daniels. Hardworking. Silent operation. No frills. No unnecessary covers. No extra cost. Nothing to get in the way. To take off. Put back. Daniels machines good-looking and precision-engineered. First quality. Easy to operate. Accessible.

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World's finest, latest and fastest Vacuum-forming machines for the refrigeration industry. Range includes machines from 30" x 30" to 80" x 50" sheet capacity.

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To cope with ever increasing demand for units and systems the Hermetic Unit Division have now opened yet another new factory. This time for the sole manufacture of Tecumseh unit systems. More and more manufacturers are realizing the tremendous benefits and substantial savings represented by the engineering genius of the Tecumseh hermetic units.

We are proud of the unequalled world wide acceptance of Tecumseh products; an acceptance underlined by the sale of over 45,000,000 compressors, which are now giving silent, trouble free service in every corner of the earth.

Production at the new factory is now under way and more than 1,000 completed refrigeration systems are coming off the production line every day.

Why not turn Tecumseh engineering vision to your benefit?

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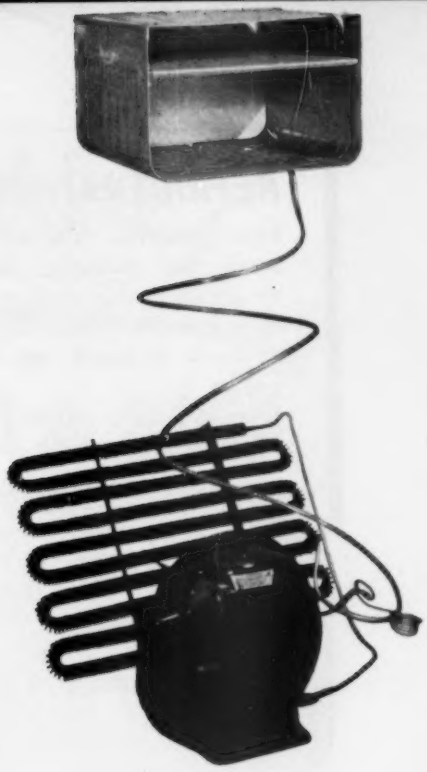
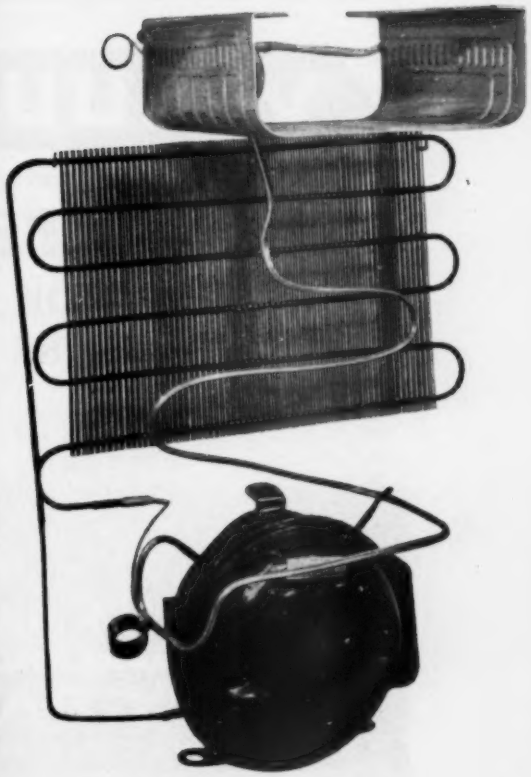


DOMESTIC SYSTEMS MODEL 57 U



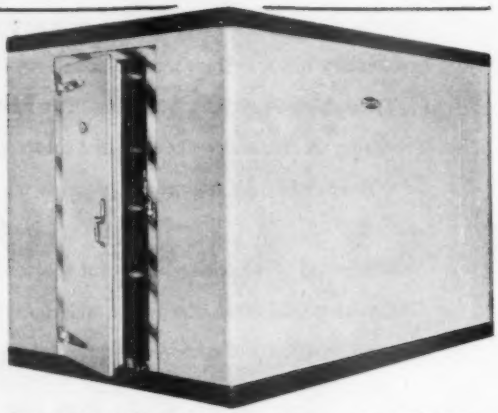
DOMESTIC SYSTEMS MODEL 34 X

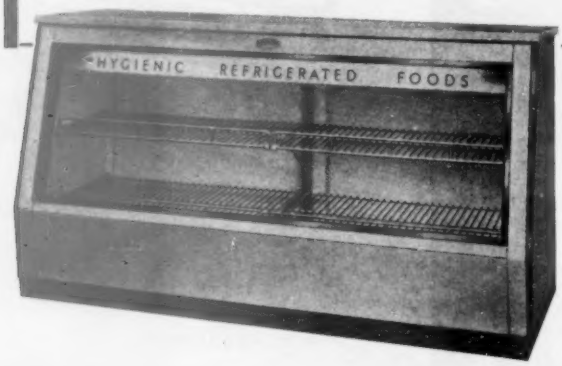
Two examples from the wide range of Domestic systems available.

REFRIGERATION at its BEST

Make no mistake. You need "FROZT-ED-AER" sound and economical Refrigeration—whether for storage of your stocks or the attractive display of your produce. Installed in your shop it will pay handsome dividends and bring you increased custom.

Write now stating your business and requirements. Applications for agencies invited.





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Automatic
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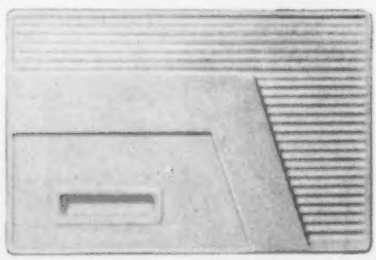

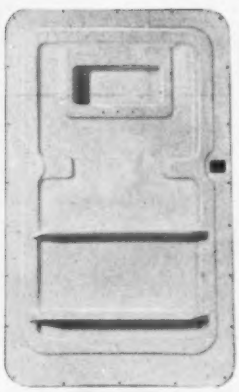

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- **SMALLER SIZE**
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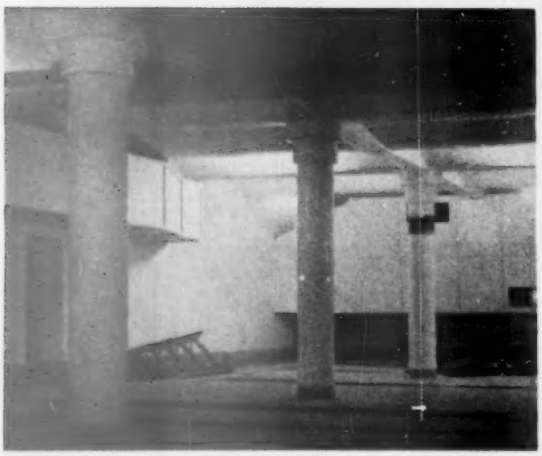
insulation

by

KEENAN

Part of a conditioning room at the Albion Brewery of Messrs. Mann, Crossman & Paulin, Ltd., London, E.1, showing progress of insulation work recently carried out by us.

Your enquiries for the insulation of Cold Rooms, Refrigeration Plant and Pipes, Water Mains, Storage Tanks, and for insulated doors and all cold store joinery will receive our careful attention.



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- ANY QUANTITY
- FULLY GUARANTEED
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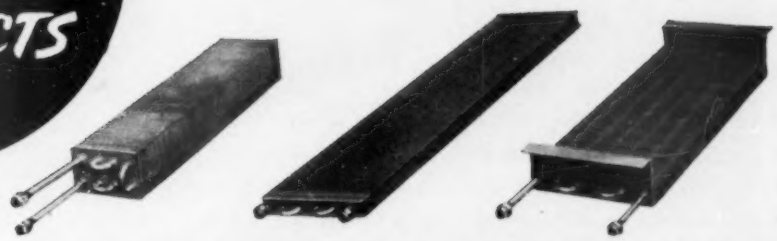
Use RA PRODUCTS

Manufacturers of Coolers and Condensers for Commercial, Industrial Refrigeration and Air-Conditioning Applications



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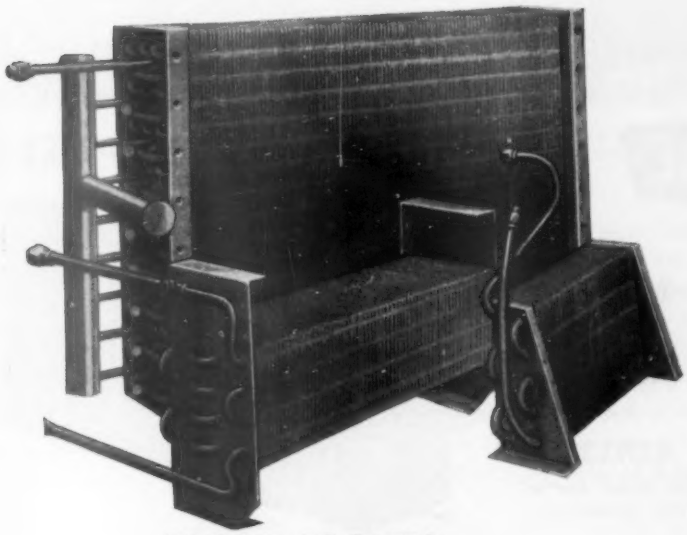
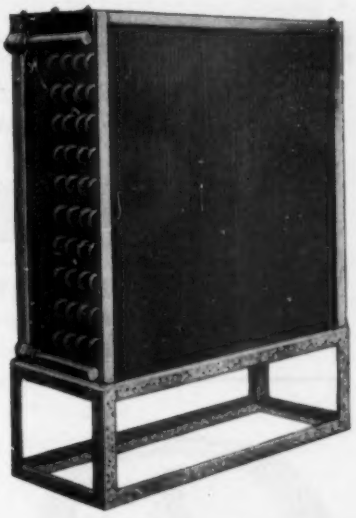
FOR :—DISPLAY CASE, COMMERCIAL and INDUSTRIAL APPLICATIONS



FINNED COOLERS
FOR AIR-CONDITIONING APPLICATIONS



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Food stays fresher in the **Winget**

CRYSTAL COOLTOP

AVAILABLE FROM YOUR REFRIGERATION SUPPLIER

A COMPLETELY RE-STYLED REFRIGERATED DISPLAY UNIT INCORPORATING THE FAMOUS WINGET-DOLE L-SHAPED VACUUM HOLDOVER PLATE

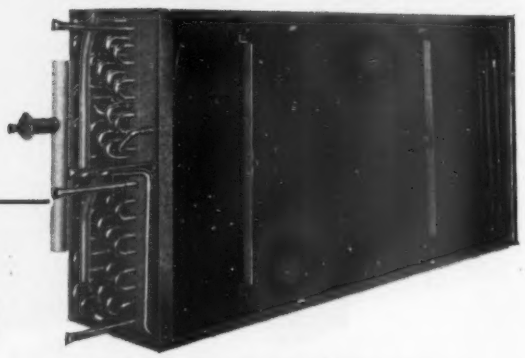
- ★ White " Darvic " Exterior With Moulded Black Plastic Front and with Black Trim
- ★ Flush Back ★ Central Terminals and Drain
- ★ 6" Wide " Formica " Shelf ★ Improved Glazing
- ★ High Quality Polished Glass-Retaining Brackets
- ★ Connection to Condensing Unit is Simple and Quick
- ★ Can be Sited on Counters or in Windows
- ★ Ideal for Self-Service
- ★ Range of Five Standard Sizes

Display more produce from your cold rooms and keep it fresh and inviting. Customers appreciate a larger display because it gives them a wider choice.

SHARP & LAW (INSULATION) LTD CARLISLE MILLS, MANNINGHAM, BRADFORD 8
Tel: Bradford 45354

SPIRAL TUBE *Coolers*

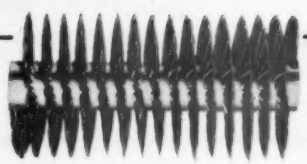
REFRIGERATION EQUIPMENT



CONDENSERS ▶
Dehydrated and sealed for use with refrigerating plant.

◀ **COILS**
Water cooled, cooling coil for Transformers

TUBES ▶
We should be pleased to advise on the choice of Finned Tube to meet any specific requirement



Designers and Manufacturers of engine, oil, and water coolers, Air Heaters, Transformers, also Unit Air Heaters

SPIRAL TUBE & COMPONENTS CO. LTD., OSMASTON PARK ROAD, DERBY Tel.: DERBY 48761 (3 lines)
Head Office : Abbey House, 16, High Street, Watford. Telephone : Watford 26781/2
Scottish Office : Messrs. McCulloch & Miller, 180, West Regent Street, Glasgow, C.2 Telephone : City 4704/5

ONAZOTE meets toughest challenge yet!

Operators of Onazote Insulation Co. Ltd. applying the 2" Onazote pipe sections in three layers to the 10" aluminium-alloy pipe-line at Canvey Island.

ONCE AGAIN a successful enterprise has proved that where extreme sub-zero temperatures *must* be maintained, Onazote insulation has no equal. Before unloading the first experimental shipment of liquefied methane gas from the m.v. "Methane Pioneer" at Canvey Island, the North Thames Gas Board insulated their entire 2,000-foot unloading line, from the jetty to the storage tanks, with a 6-in. thickness of Onazote. Since the liquid methane starts to boil off at −258°F, to avoid evaporation losses and vapour locks, the insulation of this pipe-line was of the greatest importance. Hence the choice of Onazote.

If you have any low-temperature insulation problem consult:

ONAZOTE INSULATION CO LTD

Mitcham Road, Croydon, Surrey. Telephone: Thornton Heath 3622

Subsidiary of Expanded Rubber Co Ltd
a member company of The British Xylonite Group

TA 2236

ROSS GROUP LIMITED

A YEAR OF EXPANSION AND DIVERSIFICATION

The following are salient features of the Accounts for the year ended 30th September, 1959, and of the report by the Chairman, Mr. J. Carl Ross, to the Annual General Meeting on 18th May, 1960

" The year which followed my last report on your Company in April, 1959, has been one of many achievements. These have involved a considerable broadening of our trading basis and a substantial increase in the Issued Capital. Our true present earning capacity, however, cannot be demonstrated until we are in a position to report the results of the trading of all our new acquisitions."

PROFITS AND DISTRIBUTION

Trading Profits, including income from trade investments, show an increase of £112,681, or £791,535 against £678,854 in the previous year. The Group Net Profit after Taxation is £251,160 (194,870).
After deducting the proportion of Profits attributable to Outside Shareholders £13,945 (£19,829) and adding exceptional credits as detailed £39,700 (£68,960), there is a balance available from the year's working of £276,915 (£244,001).
The Meeting confirmed the payment of the First Interim Dividend of 6%, the Second Interim of 6% paid on Capital increased to £1,760,582 5s. 0d. and a Final Dividend of 6% on Capital increased to £1,921,674 5s. 0d. At the Subsequent Extraordinary General Meeting the proposed increase of the Authorised Share Capital to £3,500,000 by the creation of 3,000,000 Ordinary Shares of 5s. each and 250,000 6% Cumulative Preference Shares of £1 each was approved.

DIVERSIFIED INTERESTS

Diversification within our sphere of operations has continued and our interests now include —
Trawler Owning ; Trawler Building and Repairs ; Ship and Commercial Plumbing ; Shipwrights and commercial joinery work ; Fish Merchanting from all Fishing Ports (Nation-wide distribution) ; Inland Wholesale and Retail Branches ; Road Haulage (Fish and general haulage, with a fleet of 500 vehicles) ; Frozen Foods (National distribution) ; Food Processing Factories ; Refrigeration Engineering (Commercial Freezer Manufacture) ; Ice Cream Factory ; Wholesale Potato and Vegetable Merchants ; Young's Potted Shrimps and Crustacea products ; Importers and Agents for all kinds of Canned Fruits and Fish (world-wide contacts) ; Austin Motor Distributors for North and East Lincolnshire ; Publicity and Printing ; Hire Purchase.
The turnover of the companies engaged in the above activities is at present running at the rate of £20,000,000 per annum.

YOUNG'S POTTED SHRIMPS LIMITED

During the past year, sales of Young's Seafoods and Dairy Products have shown gratifying increases, as quick-frozen foods become more and more a part of the British way of life. The growing demand for Scampi, Prawns, Potted Shrimps and Crabmeat, all reflect this wider interest in better food, and more varied menus generally. The Company's products are available in all good food shops throughout the British Isles.

ROSS FROZEN FOODS

Production : During the year, our Grimsby Cooked Foods Factory was completed and is now operating satisfactorily. Much of the fish used in this factory is frozen at sea, thus ensuring products of the highest possible quality. Substantial quantities of quick-frozen fish have been exported to North America, Australia, Russia, France and many other countries. At our Fruit and Vegetable Freezing and Canning Factories at Westwick there has been an increase in production and turnover resulting in profits being maintained at a satisfactory level. Extensions include the erection of a large capacity cold store to deal with the planned higher production in the ensuing year. This will enable us to satisfy increased demands for catering, shipping and institutional packs, and at the same time expand the production of a wider range and quantity of ROSS consumer packs.
Distribution : The general view is that the market for quick-frozen foods has been barely touched as yet, and that here unquestionably lies the greatest opportunity for expansion of food sales. In this country, sales of all types of the new ROSS consumer packs of frozen foods have increased by 43% during the year and repeat sales are excellent.
The change of brand names to ROSS has been well received by all sections of the Food Trade in this country.

JACKSTONE FROSTER LIMITED

Sales have been comparable with those of the previous year and have included an order from one of the leading Petfood manufacturers for 7 × 18 Station " Jackstone " Multiple Frosters which constitutes one of the largest plate freezing installations in the U.K. Our overseas orders included one from Hong Kong, thus adding yet another name to the already long list of places to which " Jackstone " freezing machines are being exported.

BENEFITS THROUGH MERGER OF INTERESTS

In a business like ours it is not easy to see what lies ahead, but our rate of growth indicates clearly the benefits which can be achieved by bringing together a group of companies whose trade is complementary one to another. We are well satisfied with the progress and prospects of our recently acquired Subsidiary Companies.

Copies of the Annual Report and Review are available from the Secretary
1, HUTTON ROAD, GRIMSBY

CLASSIFIED ADVERTISEMENTS

Prepayment of Classified advertisements is requested. Replies to Box No. advertisements to be addressed to Box No.——, **MODERN REFRIGERATION**, Maclaren House, 131 Great Suffolk Street, London, S.E.1.

SITUATIONS VACANT

6d. per word. Minimum **12/6.** Box **2/-** extra.

A LARGE BRITISH COMPANY requires a number of refrigeration service engineers for work in Nigeria and Ghana. They must be widely experienced in the servicing of domestic refrigerators and simple industrial equipment and must be capable of controlling a workshop and supervising and training local mechanics. The initial contract will be for a period of 24 months with the possibility of renewal or transfer to the permanent management staff. Salary approximately £1,300 per annum, with free accommodation plus a gratuity on satisfactory completion of tour. Apply giving full details of age and qualifications to Box 1560. 1560

APPLICATIONS ENGINEER for climatic testing refrigerators and Quality Control work. Apply E. Cowen, Lec Refrigeration, Bognor Regis. 1574

Would you like to work in a peaceful atmosphere with beautiful country around you?

GROUP OF ENGINEERING COMPANIES WITH MODERN OFFICES IN HEREFORD REQUIRE:

(1) **Technical and Commercial Sales Manager with experience of industrial air conditioning and refrigeration for home and export.**

(2) **Development Engineer.**

(3) **Sales Engineers.**

(4) **Refrigeration, Mechanical and Hydraulic Draughtsmen and Estimators.**

5-day week. Contributory pension scheme. Applications, which will be treated in strict confidence, should be made in writing stating age, experience, salary required, etc., to Managing Director, Denco Works, Hereford. 1556

COMMERCIAL/INDUSTRIAL Refrigeration Salesman required for Nottinghamshire, Lincolnshire area, leading make of refrigeration plant. Apply in writing giving full details of past experience.—Box 1553. 1553

CONTRACTS ENGINEER required to prepare quotations for industrial and commercial refrigerating plant. Appointment pensionable and offers excellent prospects. Please apply to the Personnel Manager, The Lightfoot Refrigeration Co. Ltd., Abbeydale Road, Wembley, giving details of experience and age. 1562

COMMERCIAL Refrigeration Sales Supervisor. Vacancy exists in Frigidaire Distributorship for first class experienced Sales Supervisor to lead Sales Team in the Manchester area. Only men of approved record in this field need apply. Remuneration by way of good basic salary and generous commission. 1959 car will be provided. Assistance in removal could be arranged for the successful applicant, and fares will be paid for interviews. Applications in strictest confidence to J. H. Jones, General Sales Manager, F. W. Fidler & Son Ltd., Frigidaire House, Town Lane, Denton, Manchester. Telephone: Denton 4201. 1370

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The successful applicant will be required to specify equipment for Self Service and Display Cases and his duties will include the testing of cases and the preparation of technical bulletins. This is an executive position with an excellent future and a high commencing salary.

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Education Committee
WILLESDEN TECHNICAL COLLEGE
Denzil Road, Willesden, N.W.10

Applications are invited for the following new appointment. Duties to commence September 1st, 1960.

Department of Mechanical Engineering

Assistant Grade B to teach Refrigeration Practice including the installation of plant.

Candidates for posts should possess appropriate qualifications of the City & Guilds of London Institute and should have had industrial experience.

Salary within the range (men):

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Closing date within fourteen days of the appearance of this advertisement.

C. E. GURR, M.SC., PH.D.,
Secretary to the Education Officer.
1558

FULLY QUALIFIED refrigeration engineer required for service and installations Nottingham/Derby area.—Box 1554. 1554

FRIGIDAIRE DISTRIBUTORS require experienced refrigeration engineers. Weekly salary plus overtime and commissions. Hours 8.30 a.m. to 5.30 p.m. Van garage paid. Apply R. E. A. Bott (Wigmore St.) Ltd., 28 Wigmore St., W.1. Telephone WELbeck 6644. 1547

MAINTENANCE ENGINEERS: DRAUGHTSMEN. Jackstone Froster Ltd. (a Ross Group Company) have vacancies with good prospects in their expanding organisation for first-class technicians with a knowledge of and experience in refrigeration. Successful applicants will be expected to reside in Grimsby. Superannuation and Sickness Schemes in operation. Apply in writing stating age, experience and present salary to Personnel Department, Ross Group Limited, Humber Bank South, Grimsby, Lincs. 1569

REFRIGERATION ENGINEER, with Driving Licence and sound knowledge of all mechanisms, mainly domestic, required for North London Sales/Service organisation. Top rates. Phone Fitzroy 1333 for appointment. 1570

REFRIGERATION ENGINEER—NIGERIA. British Company requires Senior Sales Engineer (25/35) to take charge of their Refrigeration Division in Nigeria. Main task will be to expand sales—both domestic and commercial—of first-class products with world wide reputation in a market of vast potential, also to supervise African installation and maintenance team. This position offers cosiderable scope for man with initiative, drive and experience and will carry a commensurate salary. Pension Scheme, free passage, furnished accommodation. Tours 18/20 months. Full pay on leave. Apply in confidence quoting "SSEN".—Box 1567. 1567

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REFRIGERATION. General Manager to control and develop small, but virile Refrigeration Company in London. Experienced in the commercial refrigeration field in all its aspects, both sales and service essential. Car, salary, commission and expenses. *No limit to the right applicant.* Own staff have been notified. Brief particulars in confidence to Box 1561. 1561

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REFRIGERATION ENGINEER, fully experienced Domestic and Commercial equipment. Flat or house available. Kent distributors.—Hartford Electric Co., Water Lane, Maidstone, Kent. 1548

REFRIGERATION ENGINEERS required for Maintenance and Commissioning of new industrial Freon Refrigeration Plant comprising American Trane, Vilter and our own manufacture. Permanent salaried position—top salaries paid for a 5-day working week. New transport supplied. In first instance apply in writing or by telephone (Teddington Lock 4406) for an interview to Alfred Porter & Co. Ltd., Stella Works, Stanley Road, Teddington, Middlesex. 1575

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SALES SUPERVISOR required for York Shipley distributor, Newcastle-on-Tyne, to prepare quotations and lead and increase team of salesmen. Experience essential. Position offers exceptional opportunity to right man. Basic salary and commission: car provided. Apply giving full details in strictest confidence, to S. C. Haswell, Sales Director, North Eastern Refrigeration Co. Ltd., 36 Newport Road, Middlesbrough. 1559

SERVICE AND INSTALLATION ENGINEER required. Experience continuous freezers, dairy and refrigerating plant.—Clarke-Built Ltd., Power Road, Chiswick. Phone: CHI 7631. 1551

SERVICE MANAGER. Company manufacturing and installing Refrigeration Equipment incorporating American Trane and Vilter Compressors for Industrial and Air Conditioning Plant requires an experienced administrator to control the Installation and Service Department. Excellent prospects and top salary offered. Apply to Alfred Porter & Company Limited, Stella Works, Stanley Road, Teddington, Middlesex. 1576

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SERVICE and Installation Engineer Senior type, with modern Frigidaire experience required for rapidly expanding department. Modern house with garage available for man moving into area. Generous weekly wage and overtime, good opportunity for reliable man to settle in delightful area. Write in confidence giving fullest possible details of past and present employment and experience to Managing Director, Abbott Brothers (Western) Limited, Cattedown, Plymouth, Devonshire. 1571

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1540

THE World Famous Manufacturers of the Kelvinator Refrigerator require additional staff to meet expansion plans. Correspondence Clerk. Home Service Dept. Excellent salary to man of experience and ability Refrigeration Engineers. For maintenance and installation work in the Greater London Area. Good salaries and conditions with Pension Scheme are offered to suitable applicants. Apply in writing to: Personnel Officer, Kelvinator Ltd., Gt. West Road, London, W.4. 1577

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COMMERCIAL AREA MANAGER requires position as Sales Manager or Supervisor. Experience 15 years selling commercial refrigeration average £2,500 per annum. Prepared to move any part of the country. Have trained over 100 salesmen in past two years.—Box 1579. 1579

REFRIGERATION ENGINEER. A.Inst.R., seeks senior appointment North of England, offering responsibility, scope, progress for young energetic man. Experience food processing/cold store/dairy engineering, steam-raising plant, electrical installations, engineering administration.—Box 1572. 1572

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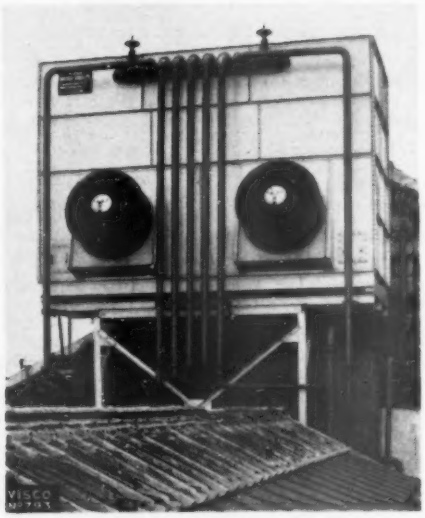

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and Air Control News

Incorporating
COLD STORAGE AND PRODUCE REVIEW
and ICE AND COLD STORAGE

Established 1898

VOLUME 63 NUMBER 747

JUNE · 1960

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The world-wide circulation of this, the original and oldest Journal of the British Refrigeration Industry, carries "MODERN REFRIGERATION" by postal subscription into the following countries:—

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Editorial . . . .

Entente Cordiale au Froid

A.S.H.R.A.E. Over the Border

Lloyd's Register, 1760-1960

● The British Refrigeration Association last month set a lead which other sections of the engineering industry might well follow when they invited the European Association of Refrigeration Manufacturers, many of them from the Common Market, to London for their deliberations. A particularly happy feature of the three-day conference was the elegant conversazione and dinner at the magnificent Haberdashers' Hall, held under the affable chairmanship of Mr. Cecil Marks who made one feel that Britain was not, after all, an "outsider" in relation to the European community.

● British Columbia's happy action in inviting the American Society of Heating, Refrigerating and Air-conditioning Engineers to hold its 67th annual meeting in Vancouver makes one realize that it is nearly 50 years since European refrigerationists travelled *en masse* to a refrigeration gathering in the United States (Chicago, 1913 III International). This state of affairs should be remedied at the earliest opportunity.

● A comprehensive and varied technical programme has been arranged for this gathering. There will be four technical sessions, with 15 papers scheduled for presentation; two symposia covering domestic refrigerator engineering and commercial refrigeration; and seven fora, from June 13 to 15. Recent developments in refrigerating equipment feature the first technical session. B. E. Eakin and R. T. Ellington, of the Institute of Gas Technology will discuss a gas-fired, open-cycle, air-conditioner in which liquid-desiccant-drying and adiabatic partial-resaturation of circulated air controls relative humidity, as well as temperature of the air, and dust and odours are removed effectively in the dual washing the air receives. A particular advantage for small commercial or domestic applications is the ease with which an open-cycle system can be adapted to year-round operation providing summer cooling and winter space heating, with complete humidity control. Thermodynamic calculations on open-cycle liquid-sorbent air coolers for various operating conditions indicate that net thermal efficiencies of 37 to 57 per cent. can be obtained, depending on cycle conditions. It is indicated that up to 44 per cent. net thermal efficiency should be attainable by this type unit.

● At another technical session in Vancouver there will be reports upon refrigerant research. L. F. Albright, of Purdue University, has as his topic the solubility of Refrigerants 11, 21 and 22 in organic solvents containing an oxygen atom. He will show the results of a systematic investigation made to determine the solubility of Refrigerants 11, 21 and 22 in several types of polar organic solvents at temperatures from 75° to 250° F. and at pressures up to those approaching the vapour pressure of the refrigerant. Refrigerant 11 is indicated as less soluble in all solvents investigated than would be predicted from ideal solution considerations. Refrigerants 21 and 22, however, have negative deviations from ideality with esters, ethers and carbonyl compounds. Both refrigerants had positive deviations with some acids and with the alcohols, glycols and glycerine.

● The oldest and largest ship classification society in the world, Lloyd's Register of Shipping, celebrated its bicentenary with a banquet in Guildhall, London, last month. The chairman of the society, Mr. Kenneth R. Pelly, M.C., presided. The Rt. Hon. The Lord Mayor of London and the sheriffs were present. The principal guest was the Rt. Hon. Lord Merriman, president of the Probate, Divorce and Admiralty Division of the High Court of Justice. The guests also included the Rt. Hon. Ernest Marples, M.P., Minister of Transport, representatives of 29 foreign and Commonwealth Governments, Her Majesty's Ministers, the Hon. W. A. Fox, Minister of Marine, New Zealand, the Bishop of London, the chairmen and members of the national committees and of the Scottish and Liverpool committees, and leading shipowners, shipbuilders, enginebuilders, underwriters and industrialists from many parts of the world. The toast to Lloyd's Register of Shipping was proposed by Lord Merriman. The toast to the Lord Mayor, the Corporation of London and the sheriffs was put by Sir Guy Ropner, deputy chairman of the society. Mr. A. C. Grover, chairman of the Corporation of Lloyd's and a member of the general committee of Lloyd's Register, proposed the toast to Her Majesty's Ministers and other guests, and the Rt. Hon. Ernest Marples replied. To mark this bicentenary a "History of Lloyd's Register of Shipping" has been compiled, a beautifully produced book that will be treasured by those who are fortunate enough to acquire a copy. It will be recalled that one of the most active periods of Institute of Refrigeration growth was during the presidency of Dr. S. F. Dorey, chief engineer surveyor of Lloyd's Register for nearly a quarter of a century. Dr. Dorey, when occupying the Institute chair in 1944, piloted through the institution corporate membership. In this book we read: "Dr. Stanley F. Dorey was an outstanding member of the Society's technical staff. His engineering apprenticeship was served in the Royal Dockyard at Chatham and he served in the Royal Navy before joining Lloyd's Register as a surveyor in 1919. He rose to become chief engineer surveyor in 1933 and decorated that office for nearly a quarter of a century. Honours came to him copiously; he was at one time or another president of four of the most important technical institutes, for two years chairman of council of the Institution of Naval Architects; he was elected a fellow of the Royal Society in 1948, and became a member of council of that austere body. Government bodies sought his advice and he read many papers, many of them bringing him fresh honours, before technical bodies."

● New cold storage construction proceeds apace. A new addition to United Carlo Gatti, Stevenson & Slaters' plant at Battersea comprises 20,000 c.ft. at –20° F. New chambers, totalling 40,000 c.ft., at the premises of Fraserburgh Ice & Cold Storage Co. Ltd., operate at –20° F. The ceiling is insulated on its upper side with two 4-in. layers of Polyzote; walls with two 3-in. layers of Polyzote, and floor with three 2-in. layers of Onazote covered with 3 in. concrete. The new Espresso House cold store in Hull is the most recent construction in cold storage in the Northern Dairy Group. Built by Northern Dairy Engineers Ltd., for Northern Frozen Foods Ltd., it will greatly

increase the ease of handling of quick-frozen foods made and packed at Espresso House. This new cold store has over 20,000 c.ft. at −15° F. Novel features of the cold store include fluorescent lighting—a new venture especially designed by Crompton-Parkinson—and external cooling units ; this latter greatly facilitates movement within the four walls of the cold store, as it means a complete absence of obstructing pipes and plant.

National Physical Laboratory

ANNUAL REVIEW OF PROGRESS

DETAILS of progress in a wide range of research programmes at the National Physical Laboratory, Teddington, were given to "M.R.'s" representative in a recent visit to the laboratory, and a review of the last year is embodied in the N.P.L. annual report.

The instrumentation and general physics section of the applied physics division has made a number of studies relating to thermal conductivity. Some commercial plastics, which contain gases other than air, have been considered ; owing to changes in composition the properties of these materials alter with time. The final steady values of conductivity of several materials have been determined. Studies have been made relating to : The thermal conductivity of glasses in relation to their composition ; the thermal conductivity of commercial silicone rubbers and the effects of silica filler on these ; measurements of granites at low temperature for industrial heat exchanger design. The work of the section has included the precise calibration of mercury thermometers and of thermocouples. Over 1,700 thermometers (including 400 to the highest precision, ±0·002° C.) and 200 thermocouples (some to ±0·001° C.) have been tested in the year. Calibrations of platinum resistance thermometers, measurements of freezing points and of linear coefficients of expansion, have continued normally.

In the test house of the applied physics division, over 7,000 liquid-in-glass thermometers were tested during the year for a variety of industrial applications. New equipment has been built to determine the pressure coefficient of deep-sea thermometers, and demand has been high for this service.

The high-pressure physics section of the basic physics division has continued its work on equations of state of gases. This has been mainly concentrated on the extensions to mixtures of gases. Following investigations of the virial coefficients of carbon dioxide and ethylene by the series-expansion method, a study is now being made of mixtures of these two gases over the same range of temperature (−10° C. to 100° C.). Measurements on a 1 : 1 mixture have been completed and work on mixtures of other proportions is in hand. It is hoped that this work will provide accurate data on the relationships between the virial coefficients of these mixtures and those of their constituents and lead to improved correlation with current theoretical work.

The thermal properties section of the basic physics division has continued its work on heat conduction, in which considerable outside interest is being shown. This is evidenced both by the number of enquiries received and by the number of laboratories now undertaking work in this field. There is a definite need for materials of a known thermal conductivity which can be used as standards in comparative test methods covering a wide range of temperatures.

New determinations of the thermal conductivities of several liquid refrigerants of the fluoro-chloro-derivatives of methane and ethane were reported to the Tenth Congress of Refrigeration in Copenhagen. Other work on liquids has included further measurements on water in the range 30° to 50° C. (which have failed to support a claim that the thermal conductivity suffers an anomalous change at about 35° C.), measurements on transformer oils and on aqueous solutions of calcium chloride during freezing.

Work has continued in this section on the thermal comparitor, which continues to arouse considerable interest. This instrument, which determines thermal conductivities of solids and fluids, thicknesses of surface deposits, surface roughnesses and temperatures, and which is now being applied for tests relating to the flow of liquids in thin-walled tubes, has been found suitable for determining the thickness of nickel-plating on steel.

The temperature measurements section of the standards division has continued its work on establishing a temperature scale below the boiling point of oxygen. To this end the construction of a helium gas thermometer has been completed and the thermometer has been used to calibrate a number of platinum resistance thermometers, including some on loan from the National Bureau of Standards and the Pennsylvania State University, over the temperature range of from 10° to 90° K. The scales of the three laboratories thus compared were found to be in agreement to within a range of 0·02° K. over the range from 20° to 90° K. ; below 20° K. there are wider divergences that must be studied further. An exchange of platinum thermometers has been made with the Central Office for Standards, Measures and Measuring Instruments, in Moscow, and this will enable the inclusion of the Russian Scale in the intercomparisons. Modifications are now being made in the helium gas thermometer to improve the accuracy of realization of the low-temperature scale, and the section proposes to redetermine the values on the thermodynamic scale of those equilibrium temperatures which are likely to be useful for defining an international scale. When these measurements are completed it may be possible to adopt internationally the proposals (or slight modifications of them) already made for an extension of the International Temperature Scale below its present lower limit of the boiling point of oxygen (−182·97° C., *i.e.* 90·18° K.).

NEWS OF THE MONTH

Refrigeration and A-c Exports.—During April, 1960, air-conditioning and refrigerating machinery (commercial and industrial sizes) to the value of £702,062 weighing 911 tons, was exported from the United Kingdom. Comparable figures for April, 1959, were 920 tons, worth £675,416.

* * *

Exports' Analysis.—Of the 911 tons of air-conditioning and refrigerating plant worth £702,062 exported by Great Britain in April—quoted in the preceding paragraph—52 tons went to the Union of South Africa, 41 tons to India, 27 tons to Australia, 51 tons to New Zealand, 16 tons to Canada, 195 tons to " other Commonwealth countries," 44 tons to Eire, 13 tons to Sweden, 69 tons to Western Germany, 78 tons to the Netherlands, 60 tons to Belgium, 13 tons to France, 42 tons to Italy, and 210 tons to " other foreign countries."

* * *

Refrigeration Plant Classified.—Of the total exports of air-conditioning and refrigerating machinery during April, commercial refrigerators accounted for 205 tons, worth £111,258, industrial plant and equipment for 128 tons worth £93,108, and refrigerating machinery, equipment and parts including parts of commercial refrigerators, for 379 tons, worth £309,687.

* * *

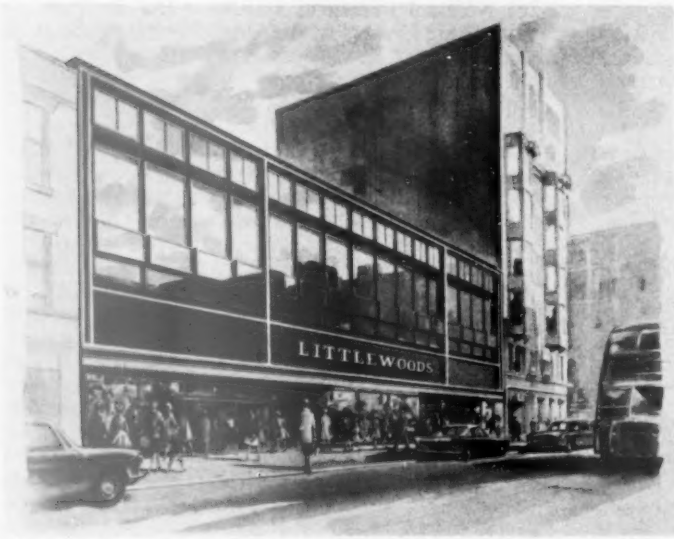
Exports of Small Refrigerators.—During April, 1,295 tons of complete refrigerators and domestic refrigeration equipment were sent overseas from Great Britain. These exports were worth £771,598. The 1,295 tons comprised 53 tons to the Union of South Africa, 24 tons to Rhodesia and Nyasaland, 13 tons to India, 43 tons to New Zealand, 608 tons to " other Commonwealth countries and Eire," 50 tons to Sweden, 89 tons to Western Germany, 26 tons to the Netherlands, 15 tons to Belgium, 40 tons to Italy, and 334 tons to " other foreign countries."

* * *

BRITAIN'S ICE CREAM LEAD

BRITAIN now leads the world in the ice cream industry, believes Mr. J. D. O. Knowles, chairman of T. Wall & Sons (Ice Cream) Ltd., and he foresees the day when deputations will come from the United States to see our way of doing things. Mr. Knowles made this statement at his Company's Scottish Region Convention meeting in Edinburgh where Wall's have a factory at Craigmillar. He said he had been very heartened in a recent world-wide tour, during which he looked at the ice cream business in Malaya, Singapore, Ceylon, Australia, Honolulu and America—Australia and America being the two most important.

" It is not so many years since our predecessors went to the States to learn the ice cream business. To-day I consider that we are probably 10 years—if not more—ahead of anything that is happening in our field in the States. Nowhere did I see ice cream of the quality which we manufacture, and marketing and point-of-sale techniques were very poor by our standards."



Department Store Air-Conditioned.—Littlewood's are opening their biggest-ever store in Argyle Street, Glasgow. The most up-to-date developments in design and decor have been incorporated in the lounge and other staff quarters. A sun-roof, will be a novel introduction for staff relaxation. Staff and customers alike will welcome, particularly during the summer months, the refrigerated air-conditioning unit by which the entire air in the store is changed every six minutes and the temperature precisely controlled.

Part of a batch of special ice-cream mobilers now under construction by Mann Egerton & Co. Ltd., of Norwich, for Neilsons (Ice Cream & Frozen Foods) Ltd., of Uxbridge.

REFRIGERATION SERVICEMEN'S ASSOCIATION

THERE is no doubt that the R.S.A. is filling a need among refrigeration personnel and the continued high standard of their monthly lectures throughout the past session is ample proof. Judging by the continued full attendances, weather did not appear to be a deterrent.

At the concluding meeting of this session, held April 27, members heard from Mr. F. W. Murray, J. & E. Hall Ltd., how the application of " Quick-freezing of poultry " has grown in this country of recent years. Amply illustrated with slides showing types of installations, adaptation of sites for them and types of equipment in use, the lecture described the processing necessary to ensure the birds reach the market in a good condition with white flesh and no loss of weight.

Included among the many slides were illustrated an automatic blast freezer capable of freezing down to -40° F. in 2½ hours, cold stores for crated and uncrated birds, slush ice and brine baths.

Altogether, this proved to be a most informative lecture.

Picture of the Month

★

Space-Age Refrigerators

Sealed inside an airtight 9-ft. capsule and resembling an Atlas (ICBM) nose cone, a compact, 1 c.ft. thermoelectric refrigerator, made by Westinghouse Electric Corporation in the United States, recently completed a simulated week-long mission into space. It was one of seven life-sustaining devices tested for the U.S. Air Force by the U.S. Air Research and Development Command (ARDC). The test was conducted at ARDC's Wright air development division (WADD), aerospace medical laboratory, Dayton, Ohio. The entirely new type refrigerator was designed to operate in the weightless environment of orbital flight and constitutes a complete food storage system for squeeze tubes of liquids, semi solids and other foods for space.

GIANT REFRIGERATOR PLANT

Luton Premises Further Extended

The Domestic Refrigeration Development Committee, in collaboration with C.S. Services Limited, last month organized a facility visit of the magazine and trade press to the Luton factory of Electrolux Limited. Afterwards the party visited Luton Hoo, the delightful home of Sir Harold and Lady Wernher, which contains priceless collections of works of art and porcelain. As is well known, Sir Harold is chairman of Electrolux.

THERE are two production lines in the Electrolux refrigerator works, one for small models and one for large. Basically they stem from the main raw materials stores, one containing the steel tubing and components for cooling units, the other containing the sheet steel and components for cabinets. Both flow lines run independently until they meet at the final assembly lines.

Steel tubing is delivered to the Electrolux stores in stillage containers, each holding about 3 tons of tubing of one size cut to the length required for its immediate use. The stillages are then moved direct from the store to the cooling unit shop by a new 3 ton gantry crane with a span of 55 ft. When the tubing has been degreased, and shot blasted in a shop extending from the store, it undergoes various bending processes before joining chain conveyors leading through the machine and welding flow lines.

When each absorption unit is assembled and welded it is given the first of a series of leak tests carried out at each successive stage of production. The next leak test is carried out on each unit when it has passed through the new processing plant where units are conveyed through an acid pickling plant, and before they travel through an oven which dries them ready for hot-dip galvanising. After galvanising, the units are transferred to the painting conveyor system which dips them into a large paint tank and carries them through the stoving oven before being evacuated and filled with refrigerant. They are then transferred to a slat conveyor for final comprehensive leak tests on all welded joints, after which the boiler cases are filled with slag wool insulation. This conveyor carries the units into a large testing room, where they undergo extensive operational tests before joining a transfer conveyor system which carries them either into the stores or to the main cabinet assembly lines.

The assembly of cabinets for all sizes of Electrolux refrigerator models follows the same system of continuous flow and begins, essentially, with the storing of the sheet steel outer casings, the storing of inner casings and the vacuum forming of plastic linings.

Doors are formed from sheet steel in one operation in heavy power presses and cabinets are formed in large V-benders. They are stored separately preparatory to being conveyed in complete sets of main components to the bonderizing and drying plant. The sets of main cabinet components are then transferred to the paint conveyor system which carries them through the electrostatic painting where they undergo the complete processes of priming, rubbing down, stoving, top-coating and final stoving. After inspection, the outer casings and doors—according to the size of refrigerator being produced—are placed on slat conveyor systems which are joined along their length by chain conveyors bringing up the plastic linings, and at this point the systems become the two final assembly tracks, and are joined by another conveyor system carrying the finished absorption units.

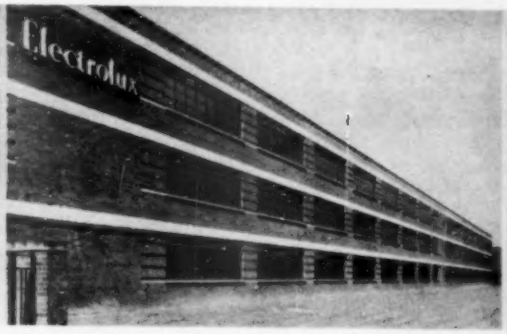
On the final assembly tracks, the cabinets are lined with glass wool insulation ; inner casings and fully assembled doors are fitted and the units are installed. The next stage is the fitting of shelves, radiator assemblies, ice trays and other features and, finally, a cabinet sealing test is applied followed by a high voltage insulation test. After a rigorous final inspection each cabinet is packed before passing on to the stores and despatch section.

Works opened in 1927

The original Electrolux works, manufacturing refrigerators and cleaners under one roof had 105,666 sq. ft. of floor area, and was opened at Leagrave, Luton, on May 18, 1927.

During World War II the factory was turned over to war production and manufactured nearly 2,000,000 jerry cans, over 250,000 depth charge and mine charge cases, over a 1,000,000 bomb cases, 4,000 steel water tanks each of 4,000 gallon capacity, tubular water storage tanks, rockets, bomb tails and parachute containers. War-time products also included large quantities of motor generators for aircraft, motor alternators and fractional horsepower motors.

Refrigerator production was resumed on a small scale during the later stages of the war to provide cabinets



THE REMODELLED LUTON FACTORY

Top centre: A view of the Electrolux refrigerator works, Oakley Road, Luton.

1. The new steel tubing store. Stillages of steel tubing cut to the length required for use are moved direct from the store to the cooling unit shop beyond, by a gantry crane.

2. The final leak test of a long series is given to completed absorption units.

3. Fitting insulation into completed absorption units.

4. A refrigerator door outer comes off a giant press.

5. Finishing steel cabinets.

6. Doors and cabinets for Electrolux model L.26 refrigerators on a continuous conveyor move through the electrostatic painting plant.

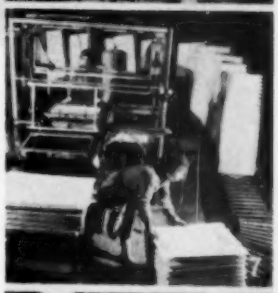
7. Vacuum forming refrigerator door linings from high-impact plastics.

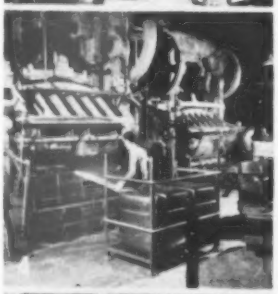
8. Inspection doors and cabinets for model L.26 refrigerators as they are conveyed from the drying chamber after electrostatic painting.

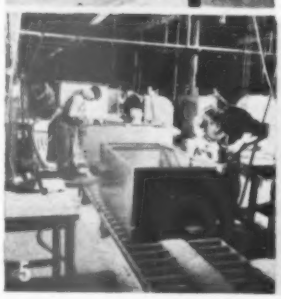
9. An assembly line; a cabinet sealing test is applied followed by a high voltage insulation test.

10. A view of a final assembly line.

Centre bottom: The new drawing office at Luton.







for allied troops abroad. Large scale manufacture was resumed when Electrolux built-in refrigerators were required by the British Government for installation in pre-fabricated houses.

On September 14, 1956, Electrolux became the first British manufacturer to produce 1,000,000 refrigerators. Refrigerator and cleaner production was divided when, in January, 1957, a new £250,000 cleaner factory providing 90,000 sq. ft. of floor area was opened opposite the refrigerator works.

An Electrolux L.37 refrigerator was the special gift presented by Sir Harold Wernher, the company's chairman, to Mrs. Wendy Hart, the millionth visitor to this year's Ideal Home Exhibition, when she visited the Electrolux stand. Mrs. Hart was visiting the exhibition with her husband, a pilot, specially to choose a refrigerator for their first home of their own at Pinkney's Green, Maidenhead. Next day her husband was due to fly his Britannia aircraft from London Airport to Montreal.

1960 RANGE

Newcomers to the Electrolux range of silent, absorption-type refrigerators for 1960 are : a 2·7 c.ft. model, the L.27, for installation in out of the way places—models operate by bottled gas or paraffin; and the new 5 c.ft. luxury refrigerator—the L.50. A useful addition to the popular model L.26 is the new " two-way " shelf to provide storage space for tall bottles, and a new feature of the Electrolux L.37 is the provision of two slim ice trays, each providing nine cubes.

The L.27 has 5½ sq. ft. of shelf area, including a gated shelf for storing really tall bottles. Door storage includes an egg rack, a shelf for bottles, and covered butter and cheese compartments. Frozen food can be kept in the ice compartment which has one ice tray providing 14 cubes of ice at each filling, and flexible dividers to allow ice to be removed in single cubes. The L.27 is available in white or cream high gloss enamel with an easy-to-clean interior cabinet of porcelain enamelled steel and ice blue decoration. Prices are : bottled gas model, £53 4s. 6d. (incl. £8 4s. 6d. P.T.) ; paraffin model, £49 2s. 3d. (incl. £4 2s. 3d. P.T.).

The model L.50 provides 10 sq. ft. of shelf area, a full-width frozen food compartment, three door shelves for eggs, bottles and small packages, butter and cheese compartments, a cold tray, an interior light and a lockable door handle. The model is supplied with a large vegetable drawer, three ice trays to provide 54 cubes of ice at each filling, and a set of food containers. The cabinet is available in white or cream gloss enamelled steel and the easy-to-clean interior is made of porcelain enamelled steel in ice blue. The dimensions are : height 4 ft. 5¼ in., width 2 ft. 2¾ in., depth 2 ft. 3¼ in. Prices of this model are : electric or gas, £96 13s. 7d. (incl. £14 18s. 10d. P.T.) ; paraffin, £92 9s. 8d. (incl. £7 14s. 11d. P.T.) ; bottled gas, £100 4s. 7d. (incl. £15 9s. 10d. P.T.).

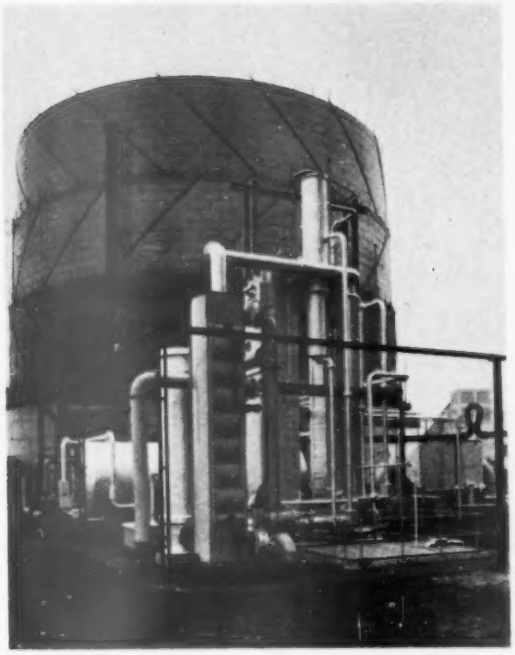
DOMESTIC REFRIGERATOR SALES

The Domestic Refrigeration Development Committee states that sales of domestic refrigerators run by electricity, gas, bottled gas and paraffin during 1959 reached a home and export total of 945,360. Sales on the home-market reached a total of 849,362—an increase of just under 100 per cent. in 1958, the previous record year, and of more than 160 per cent. on 1957.

The "cold rush" of 1959 started early in the year with January sales 250 per cent. up on last year. Month by month records throughout the year showed an average increase of 100 per cent., and a new seasonal pattern of steady sales for the domestic refrigeration industry, which up till now has had to plan for a peak summer demand followed by a severe drop in sales during Autumn and Winter.

The most significant conclusion to be drawn from the outstanding sales record last year is that the domestic refrigerator, formerly considered by many people in this country as a luxury rather than a necessity, is now increasingly accepted as an essential part of modern living.

DRYING GAS BY REFRIGERATION



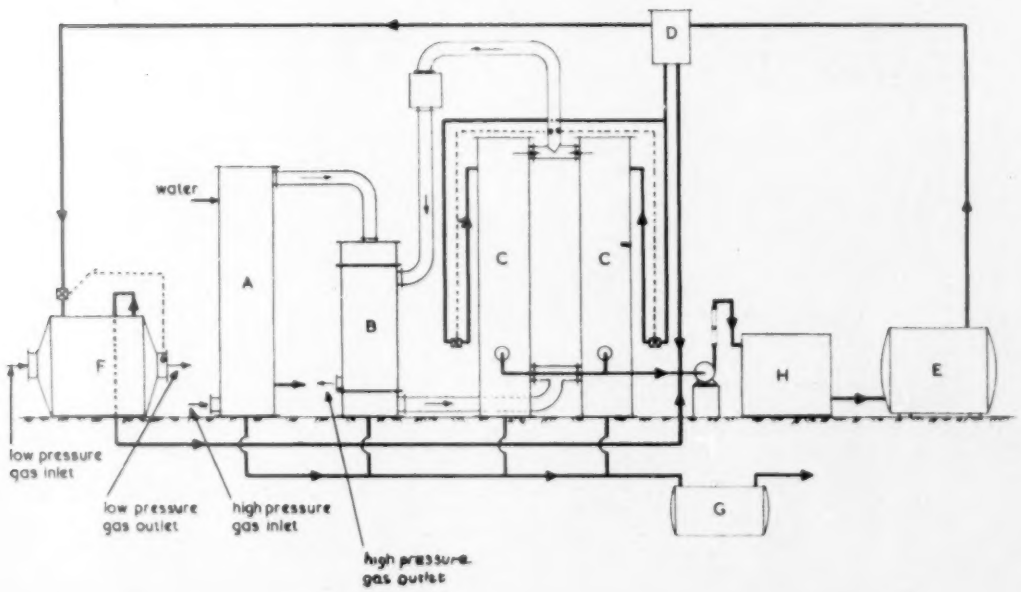
Gas dehydration plant installed at the Lostock Hall Works of the North Western Gas Board with a capacity of 5 million standard c.ft. per day.

NWGB Plant at Lostock Hall

THE gas dehydration plant at Lostock Hall, referred to last month and illustrated left, operates on the principle that the high-pressure gas, at approximately 8 to 10 lb. per sq. in. gauge, passes through the after-cooler *A* (*see diagram below*) where the heat of compression is removed. The gas is then cooled in a heat exchanger *B* with the final chilled gas before passing to the main cooler *C*. The main cooler, which is of crosstube design, is fed with chilled brine by way of a constant head pot *D* from a 6,000-gal. chilled brine storage tank *E*. The chilled gas passes through a mist catcher and finally cools the incoming gas.

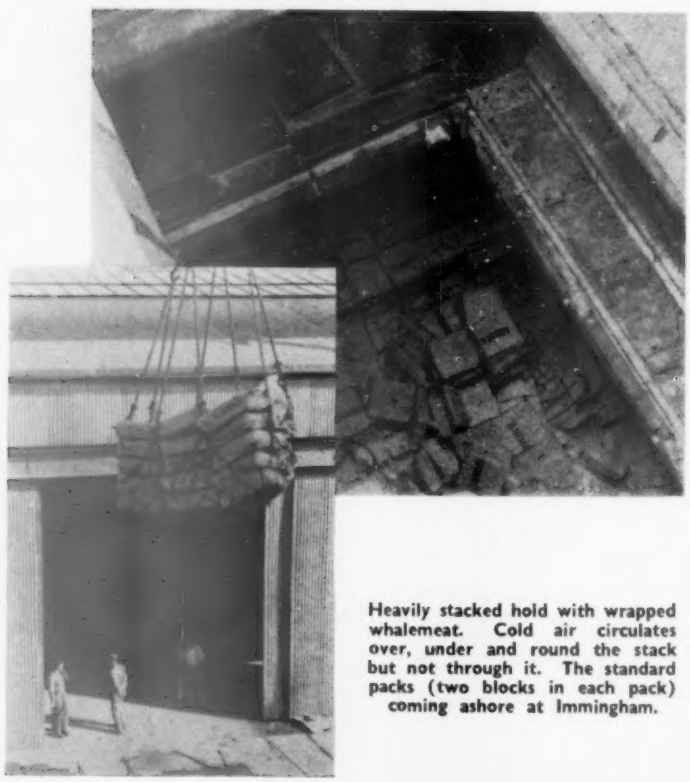
Any surplus brine pumped up to the constant head pot and not required for high-pressure gas cooling, is diverted to the low-pressure crosstube design gas cooler *F*. Both coolers are fitted with condensate drains, and the condensates from them and the heat exchanger are collected in a condensate tank *G*, utilizing the gas pressure to discharge the liquid. The circulating brine is cooled in a standard compressed ammonia refrigerating plant *H*, which—together with the high-pressure coolers, brine circulating pumps and instrument air compressors—is supplied in duplicate to avoid any interruption to the process should mechanical troubles develop or when the plant is being serviced.

Dew points of the cooled gases are controlled by air-operated brine control valves, working in conjunction with cool gas temperature recorders and controllers. Cooling of the circulating brine is controlled by a thermostat in the 6,000-gal. brine storage tank. This tank, which is kept full, provides at least two hours' reserve of chilled brine when the refrigeration plant cuts out, thereby avoiding rapid on/off cycles. Cooled brine temperatures are generally between 30° to 35° F., and at these temperatures there is no tendency for ice to form in the gas coolers. It is stated that in practice the plant has operated for several hours with the brine at 25° F. without any increase in cooler back pressure which would suggest that no ice is formed at this temperature.



"M.R." meets *Enderby* back from Antarctica

Exclusive pictures of world's most heavily refrigerated ship



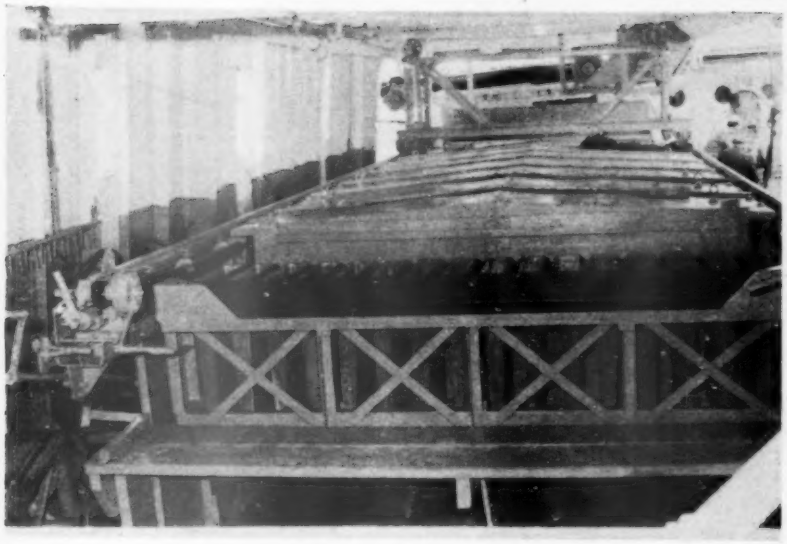
Heavily stacked hold with wrapped whalemeat. Cold air circulates over, under and round the stack but not through it. The standard packs (two blocks in each pack) coming ashore at Immingham.

THE freezing system that enabled the British meat ration to be maintained during World War II has found application in another entirely different sphere of food transport and preservation.

Readers of these pages will recall that Mr. James A. Brewster, M.INST.R., M.INST.M., invented a can freezing process during the dark days of the last war which was applied to one of the most efficient of South American meat plants at that time, that of the Smithfield and Argentine Co. Ltd. at Zarate, up the River Plate from Buenos Aires. Mr. Brewster was then general manager of the S. & A. By boning beef and inserting it into cans for freezing, meat was shipped to these shores in the concentrated stowage of the order of 50 c.ft. for the ton.

The system was later installed in *Balaena*, the great factory ship of Hector Whaling Ltd., the foremost British whaling enterprise. As reported recently in these columns, the meat freezing and transporting unit of the Hector fleet, s.s. *Enderby*, has been fitted with this type of plant and on her return last month from Antarctica she was seen in Immingham Docks by " M.R."

The extensive Hall and Haslam CO_2



refrigeration plant in *Enderby* was listed in our December 1959 issue. These giant horizontal compressors are reciprocating as happily as ever they were. There are six freezing units identical to that illustrated at the top of the next page ; each unit comprises 160 cans, each can turning out a block of 118 lb. : 180 tons of this meat can be frozen down from the hot state every 24 hours.

Very special brine filtering arrangements are incorporated in the circuit, the –40° F. brine being subjected to this treatment three times in circulating.

First picture ever published of the Brewster freezing system in its vertical can form—seen aboard "Enderby."

Cryoforming for Ph-Stainless-Steel

CLOSE-TOLERANCE control over aircraft parts made from some of the industry's hardest-to-handle stainless steels is being achieved by the Boeing Airplane Co., Seattle, Wash., through a new process developed by manufacturing research engineers of the Aero-Space Division. Called cryoforming, the process utilizes a known metallurgical transformation occurring in the metal during heat-treating. Cryoforming sizes warped or spring parts to within .0013 for each inch of a 5-in. part. To a great extent, hand-forming of precipitation-hardenable stainless steels is eliminated.

The machined, formed or welded part is heated to 1,725° F. in a furnace as part of the hardening process. This may result in warping or other distortion. The part, cooled to slightly above 200° F, is forced into a sizing die pre-warmed to 200° F, and held by clamping, banding-and-wedging or simply by the pressure of the die itself. Part and die are then cooled gradually, the final cooling, to as low as – 110° F, being done in a solution of dry ice and trichloroethylene, or in a dry cold box.

At some stage during the cooling cycle a metallurgical transformation takes place, the crystalline structure of the metal changes; molecules of carbon and iron realign themselves to form new and permanent alliances.

During this transition the metal is believed to be momentarily pliable. The steel re-forms in the precise dimensions to which it is being held at the time.

When parts are removed from the cryoforming dies, the tendency to warp or spring back no longer exists. Parts show a close fit to design dimensions and usually can be furnace-aged without further restraint. Wrinkling and bowed-out areas are erased. In one example, welded and machined T-shaped external attachment members for brazed panels were held to plus or minus .002 for each 12 in. of a 36-in. member. This tolerance is about the thickness of a human hair.

Work to date indicates that parts of PH 15-7 Mo, PH 17-7, AM 350 and AM 355 stainless steels, condition-annealed at 1,725° F. and cold-treated in cryoforming dies for 40 to 60 minutes at – 40° to – 110° F., are sufficiently transformed to eliminate spring-back.

The new Prestcold Farmoor-de-luxe frozen food sales-case, has coloured front panel in Stelvetite, the plastic-coated sheet steel produced exclusively by John Summers & Sons Ltd., of Shetton, Chester (description p. 599).

EUROPEAN MANUFACTURERS OF REFRIGERATION MACHINERY MEET AT RECEPTION IN LONDON

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European Refrigeration Association

The European Refrigeration Association last month held a two-day series of meetings in London. The Association is representative of countries of both the Common Market and the European Free Trade Area and delegates from eight countries were present.

Much information was pooled on commercial practices, statistics, professional training and technical standards, with the possibility in mind of a greater exchange of all forms of refrigeration equipment taking place between the various European countries as the plans of the Common Market and the European Free Trade Area are realized.

The meetings were organized by the British Refrigeration Association which also arranged an evening reception at the Haberdashers' Hall, in the City of London.

NEW A.R.I. STANDARD

A new A.R.I. Standard for " Sealed Refrigerant Compressors and Condensing Units, 20 Horsepower and Smaller " has been published by Air-Conditioning and Refrigeration Institute. The new standard, numbered A.R.I. Standard 515-60 replaces A.R.I. Standard 320-56, for " Sealed (Hermetic-Type) Refrigerating Condensing Units, Five Horsepower and Smaller, for Commercial Application," which will be withdrawn from circulation.

Under its declaration of " purpose," the new standard states : " That purpose of this standard is to establish, for sealed refrigerant compressors and condensing units, recommended specifications of what constitutes standard equipment ; recommended minimum net volumes of liquid receivers ; recommended minimum tube-connection sizes for liquid-line and suction-line shutoff valves ; recommended requirements for testing and rating, including standard rating conditions ; recommended minimum performance requirements ; provisions for safety ; and recommended installation and service instructions."

Covered under the document, which is intended for the guidance of the industry, including manufacturers, distributors, installers, contractors, and users, are sealed electric-motor driven refrigerant compressors, as well as air-cooled, evaporatively-cooled, and water-cooled sealed condensing units 20 h.p. (nominal) and under. It applies to sealed refrigerant compressors and condensing units using Refrigerants 12 and 22. The issue of A.R.I. Standard 515-60 is in line with the present reorganization of A.R.I. Product-Sections, under which the Centrifugal Liquid-Chilling Packages Section, the Reciprocating Compressor and Condensing Unit Section (with three sub-sections), and the Reciprocating Liquid-Chilling Packages Section, were created, and two previously-existing sections—the Small Compressors Section and the Air-Conditioning and Refrigeration Systems Section—were dropped, their members transferring to the applicable new sections or sub-sections.

Two other new A.R.I. Standards are scheduled for publication early in 1960 in connection with these changes. The new ones will be : A.R.I. Standard 511-60, Ammonia Compressors, whose publication will result in the withdrawal of the present Standards 5-12, Enclosed Ammonia Compressors, Vertical Single-Acting Type ; 5-13, Performance of Ammonia Compressors, Vertical Single-Acting Type ; 5-14, Standard Equipment for Ammonia Condensing Units, and 5-15, High-Speed Ammonia Compressors. A.R.I. Standard 516-60, Refrigerant 12 and Refrigerant 22 Compressors and Condensing Units, 25 Horsepower and Larger, which will replace existing standards 5-21, " Freon " Compressor Units, 25 Horsepower and Larger, and 5-22, " Freon " Condensing Units, 25 Horsepower and Larger.

The new Standard 515-60, which was developed by A.R.I's. Engineering Department under the supervision of the Reciprocating Compressor and Condensing Unit Section, is available from A.R.I. at 1346 Connecticut Avenue, N.W., Washington 6, D.C.

THE B.R.A. RECEPTION AT HABERDASHERS' HALL (see groups on opposite page).

From left to right in each picture: 1, Mr. A. Mansted, Mrs. Marks, Mr. C. M. Marks; 2, M. R. Malengret Lebrun, Mme Malengret Lebrun, M. A. Gerard; 3, Mrs. Rowledge, Mr. E. G. Rowledge; 4, Mr. J. Fowler, Mrs. Fowler, Mr. N. F. T. Saunders, Mrs. Saunders; 5, Mr. K. J. R. Cocke, Mr. T. Whittaker, Mrs. Whittaker, M. Bonarini, M. de Vries; 6, Mrs. Welch, Mr. D. A. Welch, Mr. Scholl; 7, Mr. K. J. R. Cocke, Dr. von Cube, Mrs. von Cube, Mr. Thorman; 8, A delegate with Sgr. Dell Orto; 9, Dr. Schrader, M. Cabal, Mrs. Schradar; 10, Sgr. Gaudenzi, M. von Ovelli; 11, Another delegate with M. Bonarini and M. de Rouway; 12, Mr. A. Mansted, Mrs. Huntingdon, Mr. A. Huntingdon.

Refrigeration at

THE HANOVER FAIR

Many new pieces of Equipment

THE German Industries Fair was held as usual this year at the Hanover Exhibition Ground from April 24 to May 3 and again proved its world wide appeal.

The area occupied by exhibitors was no less than 110 acres of which two-thirds was in the halls and one-third open air. The latter has increased by 8 per cent. and the former by 3 per cent. since last year ; the total growth since 1954 is no less than 40 per cent. in the halls and 200 per cent. open air, while in the same period foreign exhibitors have increased in number from 300 to 836, compared with an increase of German exhibitors from 3,600 to 3,900. The U.K. firms exhibiting were second in number among non-German speaking countries, being 96 compared with France 177 and U.S.A. 91. Five export agencies represented about 400 manufacturers and others from the Eastern bloc. There were, however, no national groupings.

Of particular interest to readers of MODERN REFRIGERATION, our reporter noted slot machines for cold drinks on draught exhibited by Deutsche Waggon-und Maschinen-fabriken Gmbh of Berlin, and Schwelmer Eisenwerk (Mueller & Co. Gmbh) of Westphalia, also ASTRA (Bergedorfer Eisenwerk A.G. of Hamburg.).

The DWM fontana is of large capacity for copious supplies of cooled individual beverages, special merit being claimed for accurate dispensing and quick and sure functioning with simple operation, using either glasses or beakers. The DWM automatic bottle dispenser delivers one to four different beverages in bottles as determined by selector switch combined with coin operation and in sizes from 0·2 to 0·5 litre (approx. 4 to 17 oz.) ; the holding capacity of a typical size is 124 to 160, and the refrigerating unit is ¼ h.p.

The Schwelm automatic dispenser caters for either hot or cold drinks ; the cold type having a series of syrup holders operated by top pressure of CO_2 when the appropriate magnetic valve is operated by selector push-button another magnetic valve releases the appropriate measure of cold water into an automatically dispensed beaker.

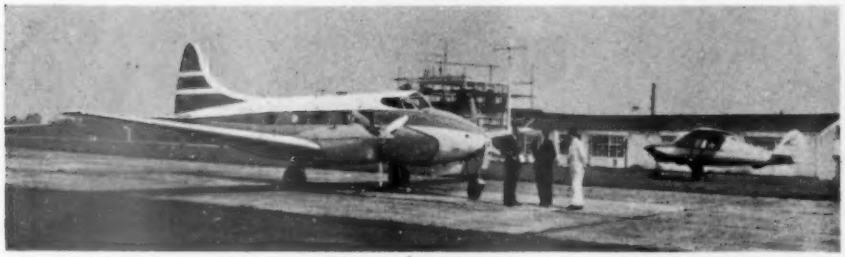
The Astra beverage cooler is equipped for direct expansion of ammonia. Other Astra specialities for the catering trades are pressure coolers for continuous cooling, crystallizing and simultaneous working of fats, pastes, etc., the cooling being either by direct expansion or brine ; also a plate freezer with a capacity of 550 lb. per hour of goods one to 2½ in. thick using either refrigerant-22, ammonia or brine.

The main Astra exhibits were a new range of VW compressors for refrigerants-12 and -22 semi-hermetic, and gland types, the latter being alternatively belt driven or direct coupled. The semi-hermetic type have the same foundation details as the belt driven compressors, as the motors are overhung. Capacities of the semi-hermetic were up to 500,000 B.t.u. per hour, the others which are also available for ammonia, extend up to 1,500,000. Two stage compressors of the cylinders in line type with condensers were exhibited, suitable for either land or marine use.

The main attraction (to our reporter) on the Linde stand was a wall or a window type air-conditioner available in 9,000 and 13,000 B.t.u. per hour sizes with 1 and 1½ h.p. motors respectively, with condenser and air cooler fans mounted on a common shaft, both sizes having a 1/12 h.p. fan motor. The elegant fronts which are flush fitting in the case of wall fixing are equally applicable in living rooms, offices, salons and consulting rooms.

A novelty on the Escher Wyss stand was a unit type of water-cooling tower available in sizes of 80,000 to 5,000,000 B.t.u. per hour in based on cooling from 88° to 79° F. with wet bulb temperature of 64° F. The weights corresponding to the above sizes range from 154 lb. to 1·95 tons these low figures resulting from the large surface per unit volume of the packing permitting a shallow bed. Transition from film flow through the packing to drop formation on leaving it is promoted by serrated underside. Water distribution is from a sprinkler arm rotated by the pressure of the circulating water.

Escher Wyss's new type of cooling tower.



Pressed Steel's first aircraft, a D.H. Dove, on the tarmac at Oxford. In the background is the H.Q. of the aviation division and the company's second plane, a Piper "Tripacer."

P.S.C. Aloft

LITTLE more than a year after it acquired its first executive aircraft, the Pressed Steel Company Ltd., of Cowley, Oxford, put their Aviation Division on show, on May 6, at Oxford Airport (Kidlington, Oxon.). Among the guests the company invited to see the home and work of the Aviation Division were a number of Oxford notabilities, including the Mayor of Oxford City, the sheriff, the Oxford City Council vice-chairman, chairman of Ploughley R.D.C., and the Mayor of Woodstock. Although the company invited 60-odd people to what was in effect an informal "at home."

Visitors saw one of the changes which have taken place since last year, when the company acquired the lease of the then Kidlington Airport from Oxford Corporation, who built the airport as a municipal flying centre in 1935. They were shown the recently completed air traffic control tower, which has been equipped with modern navigation and landing aids including VHF R/T, manual homing and cathode ray direction-finding equipment. Additional radio frequencies have recently been installed to provide full aerodrome and approach control.

They also saw—and some of the VIP's were given flights over their own City of Oxford in—the company's De Havilland Dove which, equipped with full airline radio and flight instrumentation to enable it to fly to the same weather minima as that of British air corporations. Over 500 hours' flying time have been logged on the company's business in the Dove's first twelve months. This first Dove will shortly be joined by another which the company is purchasing. They also use a four-seater single-engined Piper Tri-Pacer for shorter hops.

The spread and increase of Pressed Steel's interests throughout Britain, with factories at Cowley, Swindon, Swansea, Linwood (nr. Paisley) and soon at Jarrow—and the geographical spread of the motor industry far outside its traditional "centres"—have made imperative the quick personal transportation of directors, top management and executives, which only an air service can provide.

P.S.C.'s ANNUAL REPORT

IN his annual statement with the accounts of the Pressed Steel Co. Ltd., for 1959, the chairman, Mr. Alex. Abel Smith, T.D., J.P., says of the Prestcold Division: "Our sales, both of domestic refrigerators and commercial equipment, reached a record; our problem in fact was to meet the searing demand. A noteworthy event during the year was the award of the Duke of Edinburgh's Prize for Elegant Design to our three cubic foot 'Packaway' domestic refrigerator which continues to be a best seller.

"We are anticipating another record year but it would be unrealistic to expect an increase in sales of the magnitude that we experienced in 1959. We are planning a steady build-up in production at our new Swansea factory where the first Prestcold came off the line in March. By this time next year this highly automated plant will, we hope, be turning out all our Prestcold products and, in due course, the other household appliances on which we are working.

"I would like specially to mention the recent formation in conjunction with our bankers, J. Henry Schroder & Co. Ltd., of Prestcold Finance Ltd. As its name implies, the purpose of this company is to finance instalment purchases of our Prestcold products. Its function is complementary to the acquisition of distributors and its activities will, we believe, help to stimulate sales.

"The market, particularly for domestic refrigerators, is highly competitive; but the fact remains that less than 18 per cent. of the estimated 16,000,000 electrically wired houses in this country are equipped with domestic refrigerators. This gives an indication of the sales potential, and I am confident that our Prestcold models will continue to command a satisfactory share of the market. We continue to do a substantial export business."

Profit for the year 1959, after providing for taxation, amounted to £2,461,506, which compares with £2,017,598 in the previous year. A final dividend of 21 per cent. less income tax, is to be paid on the ordinary stock.

The new Piper "Comanche" aircraft purchased by Lec Refrigeration Limited, Bognor Regis, at the end of April is on its first business trip abroad. Mr. Frank Purley, sales director, is visiting the company's agents in Vienna to finalize their season's orders and take some urgently required spare parts.

The pilot, Mr. George Farley, is also a refrigeration engineer and will be able to offer any technical advice needed in Vienna. As Lec have their own airstrip adjoining the factory the door to door flight will take only six hours.

UNIVERSAL *returns to Britain*

H.R.H. the Duchess of Gloucester passing a Universal Cooler Cabinet at a recent London exhibition.

WITH the lifting of import restrictions on goods from the dollar countries, Universal Cooler Co. Ltd. of Barrie, Ontario, are re-entering the British market with a complete range of frozen foods/ice cream display Merchandizers and farm freezers.

Universal have specialized in this type of cabinet for over 35 years, and to-day, more ice cream in Canada is sold out of Universal ice cream cabinets and merchandizers than out of all other comparable makes combined.

Last year Universal Cooler moved into its completely new factory at Barrie, Ontario, on the way to the lovely Muskota Lakes District. Their modern plant has a production capacity of over 2½ times the previous factory.

This large scale production enables Universal to offer high quality freezers and merchandizers in the United Kingdom at very competitive prices. The 16·8 c.ft. farm freezer (E17H) will retail at £135, and features an automatic interior light, counter balanced lid, storage baskets and key lock. Exterior finish is in white Dulux bonderized before painting. Other models in the farm freezer range are the 13·2 c.ft., to retail at £125, and the 21·7 c.ft. at £155. Generous discounts are available to distributors, it is understood.

Examples taken from the Universal deep freeze merchandizer range are a 12·0 c.ft. glass fronted display cabinet (LPG 120) which will retail at £229, and a 9 c.ft. merchandizer (LFP 960) to retail at £175.

At their stand at the *Daily Mail* Ideal Home Exhibition Universal received many enquiries from interested distributors, as well as taking a large number of individual orders for farm freezers.

Distributor enquiries are now being followed up from Universal's London office recently opened at 9 Evelyn House, 62 Oxford Street. We understand that Universal do not intend to tie their British distributors either by way of minimum purchases or exclusivity.

"To be fully successful a refrigeration distributor must be able to sell the merchandizer, the farm freezer or any other piece of equipment, which is the best available at its own particular point in the range, irrespective of the manufacture," Mr. Lloyd McKee, president of Universal Cooler recently stated and added—"We are confident that the quality, dependability and price of Universal products will strengthen the existing ranges sold by British distributors without expecting from them, or imposing on them, artificial restrictions and qualifications."

ASHRAE OFFICERS

New officers will be installed by the American Society of Heating, Refrigerating and Air-Conditioning Engineers when it meets in Vancouver on June 13-15 for its 67th annual meeting. Under the plan for consolidation by which ASHAE and ASRE became ASHRAE, Walter A. Grant will succeed D. D. Wile as president; R. H. Tull will become first vice-president and John Everetts, Jr. will be second vice-president. As official nominee it is likely that the next treasurer will be John E. Dube.

Walter A. Grant is vice-president, director of engineering, Carrier Corporation, Syracuse, N.Y., R. H. Tull is manager, product engineering dept., Westinghouse Electric Corporation, Columbus, Ohio, John Everetts, Jr. is consulting engineer, C. S. Leopold, Inc., Philadelphia, Pa., and John E. Dube is president, Alco Valve Company, St. Louis, Mo.

CORRESPONDENCE

ALLOY FREEZING PLATE EFFICIENCY

To the Editor Modern Refrigeration.

Sir,—Certain advertisements which have appeared recently in your journal will have given the impression that alloy freezing plates are 300 to 550 per cent. more efficient than those manufactured by my company.

It should be clearly understood that such improvements in freezing speed as may be obtained are not a direct function of the higher heat transfer character of the alloy, but mainly relate to the greater amount of refrigerant which can be passed through the alloy plate. This in turn, however, requires greater compressor capacity—which has to be paid for by higher capital outlay and by increased operating cost.

One of the advertisements in question states, incorrectly, that the vacuum space between the tubing contained in the steel freezer plate is 2½". In fact the space is only half this figure.

Yours etc.,

L. O. Lawrence.
Sales Manager
Winget Refrigeration Ltd.

London W 1
May 9, 1960.

Bacteria at Low Temperatures

by W. SUMMER

A CERTAIN range of bacteria known as psychrophils (from the Greek psychros—cold, philein—to love), which grow profusely at low temperatures, are presenting the refrigeration industry with problems. The widely held assumption that these cold loving (psychrophilic) bacteria are not detrimental to the cold storage of food-stuffs, has received a severe blow by the discovery that they are much more common than was anticipated[1]. They have been found in the intestines of salt and fresh-water fish, in chilled or frozen meat, in raw or pasteurized milk, in cream, butter, tap water, ditch water, in garden soil, fresh or frozen vegetables, flour, in the air, etc.

To the bacteriologist, the psychrophils are known as serratia, achromobacter, flavobacterium, micrococci, pseudomonas, and others. These micro-organisms are responsible for food spoilage below 10° C. Domestic refrigerators work at temperatures between 3° and 5° C. and it is at this level that bacterial activity quickly develops[1] as is shown for Pseudomonas fluorescens:—

Temperature	20°	5°	0°	−3° C.
Cell count	995	1850	1590	1200

Strains of Pseudomonas can play havoc in dairies as these bacteria are responsible for causing unacceptable off-odours, flavours, and pigments in butter, cheese, and other dairy products, but rarely affect milk and cream if the temperature is kept low.

Chromogenic bacteria, *i.e.*, those causing discoloration by producing pigments, predominantly appear on chilled poultry during the early stages of low temperature storage. Pseudomonas strains prefer frozen pork and lamb and chilled poultry, but micrococci are responsible for the spoilage of chilled beef[2].

Unfortunately, a domestic refrigerator is no absolute safeguard against salmonella food poisoning. Strains of salmonella grow well at temperatures as low as 1° C., *i.e.*, lower than the temperature in the domestic refrigerator.

Metabolic functions and motility of some psychrophils are not inhibited by as low a temperature as −4° to −6° C., but that is not the real danger. The crux of the matter is the low temperature range centering at about 3° to 5° C. within which these organisms flourish most vigorously. Food transferred from a deep freeze to a domestic refrigerator is an ideal growth medium for cold-loving bacteria. The psychrophils will grow and multiply rapidly due to the favourable environment.

Psychrophils produce indole and decompose protein. Indole has an offensive smell. Its low threshold of stimulation makes it the more perceptible.

Experiments to control the growth of psychrophils in domestic refrigerators by using antibiotics have not been successful. After a short time, antibiotic-resistant strains had developed making further doping with antibiotics undesirable and, in fact, ineffective.

Psychrophils show no variation from mesophils and thermophils in their reaction to ultra-violet radiations of certain wavelengths, nor to nascent oxygen or ozone. The mechanism underlying bactericidal action is well known. Nucleic acid (NA), the substance from which bacteria, viruses, etc. are made, heavily absorbs ultra-violet radiation of 2537A wavelength. Bacterial nucleoprotein and ribose nucleic acid also absorb the radiation. This denatures the protein molecule of the micro-organism, causing its death[3].

Of the bactericidal agents available none except ultra-violet radiation can be used safely with food, or blood (in blood banks) stored in refrigerators of the domestic type. The source of radiation is a special grade quartz tube within which an electric discharge takes place at low pressure. Almost all of the ultra-violet power is emitted at 2537A in a properly designed monokymatic tube which means that emission is at maximum bactericidal wavelength.

TABLE 1

Ultra-violet Emission Spectrum of a Monokymatic Generator in Quartz.

wavelength A	*intensity μW/cm.²/100cm.*
2482	0.03
2537	120. (98.6%)
2652	0.07
2804	0.02
2894	0.05
2967	0.22
3022	0.07
3132	0.71
3342	0.04
3650	0.65

In most cases, ultra-violet radiation is the only bactericide required. The additional safeguard of nascent oxygen and ozone as microbicidal agents is not essential. These gases readily oxidize fats and may cause off-flavours in meat, fat, butter, milk, and other susceptible products. Vegetable matter is not affected. This at once deprecates the use of equipments the germicidal action of which is based solely on ozone produced in a silent electric discharge.

Special ultra-violet sterilizers can be made to yield maximum output at bactericidal wavelength without also generating ozonogenic radiation. These rays stay completely suppressed. This is achieved not by using filters, but a specially prepared tube of pure quartz (not glass).

Ultra-violet rays are the microbicidal agent *par excellence*. With the same reliability as they kill bacteria, they destroy viruses and moulds. The latter are important as the cause of growth on meat known as "whiskers." A side of beef infected by colonies of mucor, sporetrichum carnis, thamnidium, or aspergillus niger can be saved in the early stages of infection although chunks of meat will be wasted by cutting out the mould from the meat into which it has grown deeply and quickly. Such, or worse, losses are safely avoided by using ultra-violet sterilization in cold storage.

In many applications a combination of bactericidal and deodorizing radiation is required in cold storage space, in refrigerated cargo ships, etc., where a variety of goods is carried at the time, or at different journeys, but in the same cargo space. Under such conditions, cross-tainting of the goods is likely to cause financial loss. Various techniques have been designed for all cases occurring in refrigeration practice to give bactericidal effect only, or bactericidal and deodorizing action combined, taking into consideration at the same time whether the goods are mainly vegetable or animal.

The arrangements of refrigerated air circulation vary greatly and range from small fan and freeze units used locally in chambers of moderate size, to centralized refrigerating stations providing huge volumes of air at low temperature for distribution to large cold storage spaces. In small installations the sterilizing unit may be arranged locally. In a plant where refrigerated air is distributed in ducts from a central freezer to the storage space, the air can be sterilized and deodorized centrally, or locally after emergence from the ducts. When treating the air centrally by radiation and nascent oxygen, bacteria and odours causing cross-tainting are taken care of simultaneously and away from the animal foods, a point which is of importance.

The economics of ultra-violet sterilization in cold storage space are much in favour of this method.

The consumption of a monokymatic quartz tube designed for this purpose is only 50W which allows it to operate for 20 hours for the price of one electric unit, *i.e.*, 1½d. These tubes can be operated off A.C. or D.C. mains, the latter being of importance where installations are planned in refrigerated cargo ships, although recently all new ships are equipped with an A.C. supply at either full mains, or low voltage. One such tube will provide coverage for a space of about 4,000 to 5,000 c.ft. depending upon the arrangement of racks and shelves, and often it is possible to control larger volumes with a single tube.

[1] INGRAHAM, J. L., STOKES, J. L. (1959). *Bacter. Rev.* 23, 3; 97-108.

[2] AYRES, J. C., *et al.* (1950). *Food Technol.* 4; 199-205.

[3] LAVIN, G. I., *et al.* (1938). *J. Biol. Chem.* 125; 75.

THE ROSS ROTOR CABINET

Revolutionary Design

A CABINET of revolutionary design, the Ross Rotor, the main object of which is to display quick frozen foods to the public by means of moving trays, suspended between endless chains in such a way that the trays remain in a horizontal position as they move across the top of the cabinet, descend vertically at one end, move horizontally along the bottom and then rise vertically again to the top (see illustration), has been developed by Jackstone Froster Limited. Specifications of this cabinet, several of which are already in use, have recently been made available. The company displayed one on its stand at the recent Ideal Home Exhibition.

The design provides a considerable increase in display area as compared with the orthodox cabinets and as the packages are sold they can be immediately replaced by fresh ones either from a separate storage cabinet or from the inner storage compartment situated between the four chain wheels. Access to this storage chamber on the prototype is by lifting off one of the trays. The frozen foods stored in this compartment can remain in their bulk cases, the top of the case being removed for easy access. When this case is empty it is replaced by a new case and the stock is, therefore, turned over continuously and frequently. Another big advantage is that the moving trays (in the case of the prototype cabinet) spend the greater part of their time at the lower level of the cabinet; there are at all times four trays in the top position and eight at the lower levels.

The movement of the trays themselves causes a slight stirring effect within the cabinet giving an equally distributed temperature throughout the cabinet. In the patent specification the company has covered several aspects of this application, including a number of trays suspended on a star wheel arrangement moving in a circular path and also a similar arrangement to the Ross Rotor but having the trays running the length of the cabinet instead of across the width. Another variation would be access to the storage container by means of a door in the side or end of the cabinet.

The company states that further development is required before a production model can be envisaged but on the experience already gained they are quite confident that this cabinet has tremendous advantages.

The container is made from 16 gauge aluminium and is insulated with 4-in. "Styrocell" expanded polystyrene. The top cover plates are made from 20 gauge stainless steel and the whole cabinet is mounted on six rollers which enable the sales staff to move it into any position required in the food section of the store. A strip light is mounted above the cabinet to illuminate the contents and surmounting this is a neon sign with the words Ross Rotor.

The cabinet, which is 36 c.ft. capacity, contains 12

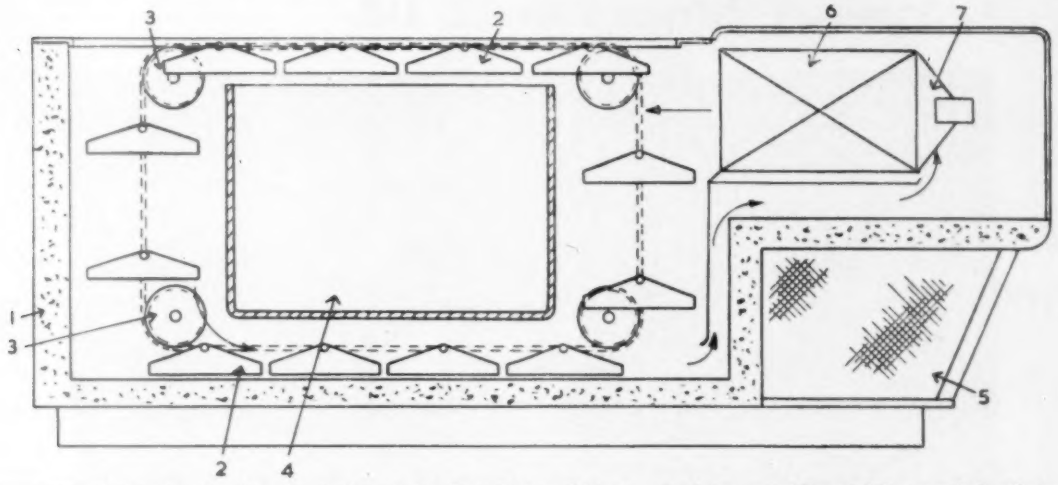
trays of varying widths to accommodate different packs of frozen fish, fruits and vegetables. A reserve storage chamber is also incorporated and this can be lifted out complete to give access to the conveyor mechanism. The revolution of the trays (which can be moved to facilitate cleaning) in the cabinet is by means of a chain drive from a geared motor. One complete revolution takes 72 seconds and a stop/start switch is mounted which can be operated if necessary by a customer.

The freezing unit is ½ h.p. semi hermetic air cooled and is fitted with a dehydrator and solenoid valve. This will maintain minus 10° F. in the cabinet comfortably. The air cooler installed is built in electric defrost heaters and defrosting of the cabinet is completely automatic by means of a preset time switch.

A drip tray is fitted with built-in heater and drain connexion to ensure a quick disposal of water, and a small capacity fan is incorporated which gently circulates the air round the container.

A test of dehydration weight losses has been made comparing the Ross Rotor with a standard cabinet of open top type over a period of 28 days. The packs used in the test were known to suffer from dehydration losses and indicate that the loss in the standard type cabinet was approximately 17 times more than in the Ross Rotor. This is considered to be due to the fact that the cooler used on the Ross Rotor has a very large evaporative surface compared to the standard tank and plate type evaporators.

This cabinet, states the company, is bound to appeal to housewives who so often have to delve into a frost coated cabinet to search for the pack they require.



Cross-sectional drawing showing the design of the Ross Rotor Cabinet. 1. 4 ins. of "Styrocell" expanded polystyrene; 2. display trays; 3. chain wheels; 4. bulk storage chamber; 5. condensing unit chamber; 6. Searle Bush finned tube evaporator coil with electric heater for automatic defrosting; 7. circulating fan.

FARMOOR-DE-LUXE CABINET

A NEW version of the Farmoor frozen food sales case, the Farmoor-de-Luxe, has been introduced by Prestcold as an addition to their range.

The new model incorporates a front panel in grey or red tweed-embossed Stelvetite plastic-coated sheet steel produced by John Summers & Sons Ltd. Stelvetite has an important practical application, being highly resistant to bumps, scratches, humidity, oils and greases. A wipe-down with detergent is sufficient to keep it in prime condition.

Requiring a floor space of only 72¼ by 32¼ in., the Farmoor-de-Luxe holds approximately 388 lb. of frozen foods. The display is illuminated from the inside and the packs are instantly recognizable through the large display window. Consisting of four sheets of plate glass, equally spaced and completely sealed in a rubber surround, this window is always free from condensation and misting. Temperatures of about 5° F. and below are maintained within the display compartment in ambient temperatures of up to 90° F. (32° C.) with free flow of air to the condensing unit. More than 90% of the packs in a fully loaded case are at 0° F. (–18° C.), or below. Maximum refrigerating capacity is maintained by automatic defrosting of the cooling unit which takes place at regular intervals. Power is supplied by the Super-Presmetic motor-compressor, which is guaranteed for five years.

The Farmoor-de-Luxe is priced at £378. A display panel, with built-in fluorescent lighting and carrying four illustrated display cards, is an optional extra at £23.

We are informed that the architects for the vast Heinz food factory described in our February issue, were J. Douglass Mathews & Partners, 3 Ebury Street, London, S.W.1, and that the consulting engineers for this building were G. H. Buckle & Partners.

AROUND THE DISTRIBUTORS

1. Somerset Refrigeration Co. Ltd.

AS main distributors for York Shipley and Hussmann British, Somerset Refrigeration have become an important selling force in the south-west of England since the war.

The company is managing-directed by Mr. John A. Collins who founded this undertaking in 1946 in Taunton. Redesigned and modernized showrooms were recently opened at 45, Station Road, Taunton, where a wider range of commercial and domestic refrigerators and other domestic appliances can be displayed to greater effect.

More than half the space in the new showroom is occupied by commercial-size refrigerators and deep-freezers. The company's policy is to have one model on show and keep a stock in the store of from 6 to 10 of each model, with forward orders to cover the year.

Mr. Collins is a firm believer in " direct mail " for business promotion and has employed this method to good effect for more than three years, with cafés, hotels, food shops and farmers as the principal recipients. Every approach is made in the form of three postings. Shops provide the best response but farmers have recently taken to buying large deep-freeze cabinets in which they stock their own garden and farm produce for household use as well as shop-sold foods. Farmers are accustomed to making purchases in quantity and seasonal food bargains have a particular appeal to them. No fewer than 50 per cent. of the company's sales of deep-freezers are sold to farmers.

Letters are sent to about 500 farmers at a time. Written by a member of the sales staff, they are no longer than can be comfortably contained on a single quarto-sized sheet, with plenty of space between paragraphs. The style is informative rather than exclamatory, pointing out the special advantages of deep-freeze ; but most letters include a catch-phrase concerned with service. Taunton is a large market town and many farmer-customers call in as a result of the approach. Others

TWO and Lec cabinets can be seen in this window.

ask to be sent literature and, in due course, are called upon by the company's single outside salesman.

Ten electrical engineers, who have six vehicles between them, and the use of radio communication with the vans, and between the vans, constitute Somerset's modern approach to service. Users require quick response to any appeal for help, and in this sort of emergency the radio is invaluable. A van on its way back to Taunton may be quite close to the scene of the repair. Mileage is cut down, and the customer can be very impressed to have a mechanic on the spot well before it is possible to have driven out from Taunton.

The success of these methods is indicated by the fact that although the area in which sales of domestic appliances are made has contracted in recent years, those to farmers and other "commercial" consumers are made within the 20-mile radius as before. Service and maintenance are, of course, free throughout the manufacturer's guarantee period.

In 1956 the company joined the group of Gardiner Sons & Co. Ltd., of Bristol. This group, with the addition of Arthur Brand Refrigeration, Plymouth, acquired during 1959, now forms the largest refrigeration company in the south-west.

Mr. Collins is a local director of the Somerset Refrigeration Co. Ltd. and he is also on the board of the Bristol holding company. Mr. G. Wilmott, from the Bristol company, now assists in the Taunton showrooms.

Advantage is being taken of the Gardiner association to centralize buying and some book-keeping.

In addition to direct mail, advertisements are placed in local sporting magazines and handbooks, and the cinema is used to advertise English Electric appliances.

OBITUARY

G. H. Connelly

George Henderson ("Jock") Connelly was fatally injured in a road accident at Gerrards Cross, Bucks, on May 22. George was a young man of outstanding personality, who began his working life as an electrical engineer and was apprenticed to the trade. After service in the Royal Navy he entered the refrigeration industry and finally joined the company of A. Porter & Co. Ltd., Teddington, Middlesex in 1955. He was promoted to the position of service and erection supervisor and served in this capacity for the majority of his time with the company.

With his drive and ability his prospects were indeed bright and it was a great shock to his friends and colleagues when this accident happened. Together with his friends and colleagues all who knew him join in extending their deepest sympathy to George's family in their bereavement.

APPLICATIONS RECEIVED

March 31—De Havilland Propellers Ltd., Goodwin, L., P11307, Refrigeration system.

April 1—Pressed Steel Co. Ltd., Hart, J., P11513, Refrigerator etc., cabinets. 5—London Ice & Cold Storage Co. Ltd., Turner, H. J., P12028, Heat transfer units. Reade, D. H., P12121, Refrigerators. 7—Vokes Ltd., Aukland, J. R., P12471, Air-conditioning filters. 8—Bauknecht G.m.b.H. Elektrotechnische Fabriken, G., C12681, Refrigerators drip tray device. 12—Edwards High Vacuum Ltd., and Rowe, T. W. G., P13090, Foodstuffs freezedrying. 19—Lucas (Industries) Ltd., J., Lee, D. E., P13611, Vehicles air-conditioning systems. 20—Associated Electrical Industries Ltd., Fury, C. E., and Koutson, E., P13843, Refrigerators. 21—General Motors Corporation, C13987, Freezer tray-grid assembly. 25—Rennert, A., P14341, Food Freezing method. 27—Hall Ltd., J. & E., and Elliot Bros. (London) Ltd., Ranken, M. B. F., P14711, Cooling chambers. 28—Fingscheidt G.m.b.H., F., Lock, W., C14872, C14973, Refrigerator locks. 29—Bank, A. H., C15131, Refrigerators.

May 2—London Ice & Cold Storage Co. Ltd., Turner, H. J., P15432, Anti-frost heave mattress. 3—Electrolux Ltd., C15512 Refrigeration apparatus; Towlin, W. J., and Williams, D., P15478, Refrigerating apparatus.

COMPLETE SPECIFICATIONS ACCEPTED

April 21—General Motors Corporation, 837,385, Refrigerator cabinet. 27—Dunham Bush Inc., 838,532, Cooling apparatus and the like and refrigeration systems incorporating same; Teddington Refrigeration Controls Ltd., 838,944, Thermostatic devices; Robbins, A. A., 838,195, Refrigerating or cooling package and a method of making same; General Motors Corporation, 838,358, Refrigerator cabinet, 838,365, Refrigerator cabinets.

May 4—Foster Instrument Co. Ltd., Oughton, H. G., and

(*Continued on page 605*)

Refrigerated Vehicle for Nigeria

HOLDING THREE TEMPERATURES IN ONE BODY

A REFRIGERATED vehicle has been built recently for U.A.C. Motors (London) Ltd. for the West African Cold Storage Company who will use it in Nigeria.

This vehicle is fitted with a Thermo King KL.20 refrigeration unit which is of the air blast type.

The body itself has 6 in. of polystyrene insulation and while the photograph shows a two compartment body, there is a sister vehicle which has a removable partition to turn it into a three compartment body, the transfer of air from one compartment to the next being achieved by means of a standard Thermo King two temperature kit, fully-thermostatically controlled. This kit consists of a fan and return air grills. In the two compartment job the front compartment is approximately 15 ft. long and is maintained at a temperature of 0° F., the second compartment being approximately 3 ft. long and maintained at a temperature of 45° F. In the three compartment job, the front compartment approximately 8 ft. long is maintained at 0° F., the central compartment approximately 7 ft. long is maintained at 10° F., and the third compartment at 45° F., the same as in the other body.

The body construction is of the "Sparshatt," all-welded, tubular steel construction, but direct metal contact between the inner and outer skins is avoided by means of the introduction of non-conducting material between the two frames. The construction is extremely robust, the same type of construction being used for vehicles built by the Southampton company for various Middle East oil companies and others who use such vehicles under desert conditions and where no roads are available.

This body is typical of many which Sparshatt's have been building both for the home and export market and they believe it is one of the first bodies to be exported from this country utilizing Thermo King refrigeration for which they are distributors.

A pamphlet issued by British Resin Products Limited, describes the growing use of "Rigidex" high density polythene in the packaging field, where its introduction has made it possible to provide packs and packaging methods which could not be achieved as effectively or as economically in other materials. Rigidex, states the pamphlet, is stiffer than ordinary polythene and has superior temperature resistance, lower permeability and excellent resistance to oils, grease, chemicals and most common solvents. These properties are of considerable value in a wide variety of packaging applications, and among those discussed in the new leaflet are boilable packs, clear film for carton over-wrapping, detergent bottles, closures and thin-walled containers. The leaflet is available on request from Information Department, British Resin Products Limited, Devonshire House, Piccadilly, London, W.1.

The Institute of Refrigeration Bulletin

Institute Headquarters: New Bridge Street House, New Bridge St., London, E.C.4 (CENtral 4694)

MEMBERSHIP

At the meeting of members held on May 5, 1960, the following were elected to membership of the Institute :—

Member

*Brown, Timothy Patrick Gordon, c/o L. Sterne & Co. Ltd., The Crown Iron Works, North Woodside Road, Glasgow, N.W.

* Transfer from Associate Member.

Associate Members

Beveridge, Douglas, 148, Hamilton Road, Rutherglen, Glasgow.

†Douglas, Thomas Ewan McQueen, c/o Wm. Douglas & Sons (Engineering) Ltd., Brewhouse Street, Putney, London, S.W.15.

Gillard, Kenneth George, 26, Warren Road, Ashford, Middlesex.

†Rahmatallah, Fakhri Mohammed, 29, Otford Crescent, London, S.E.4.

‡Scotland, William Brian, 1055, Bomorda Drive, Oakville, Ontario, Canada.

† Transfer from Graduate. ‡ Transfer from Associate.

Associates

Benn, Alan, Blunt's Hall, Little Wratting, Nr. Haverhill, Suffolk.

Fisher, William DeValera, 5, Elliston Place, Glasgow, S.W.3.

Gibb, William, 15, Parkside, Wallasey, Cheshire.

Gorringe, Leonard, 7, Park Road, Hanworth, Feltham, Middlesex.

†Lacy, Robert Herbert, 38, Belmont Road, Harrow Weald, Middlesex.

McFarlane, Joseph Murray, 158, Graigton Road, Glasgow, S.W.1.

MacFarlane, Walter Lewis, 95a, Temple Road, Cricklewood, London, N.W.2.

Reid, Alexander Abercrombie, P.O. Box 1951, Nairobi, Kenya.

† Transfer from Graduate.

Graduates

Bastick, Paul Ellis, 4, Upperton Road, Sidcup, Kent.

Bidichandani, Indru Jiwatram, 36, Hemberton Road, Clapham North, London, S.W.9.

Brown, Richard Henry Charles, 193, Burnt Oak Lane, Sidcup, Kent.

Foley, Peter Neville, 30a, Blackbird Hill, Kingsbury, London, N.W.9.

Hathiramani, Jamak, 73, Queensborough Terrace, London, W.2.

Ho Fong, c/o Mr. R. C. Olive, 136, Ebury Street, Sloane Square, London, S.W.1.

Mulherrin, Noel Francis, 12, Church Crescent, Finchley, London, N.3.

Murray, Keith, 35, Birchwood Road, Wilmington, Nr. Dartford, Kent.

ESSAY COMPETITION

THE journal *Research* is this year sponsoring The Waverley Gold Medal Essay Competition for the eighth year in succession. The competition is designed to encourage the scientist in the laboratory and the engineer in the production plant to express his views and translate his work into an essay that will be readily understood by other scientists, directors of industrial firms and others interested in science and technology.

The Waverley gold medal, named after and bearing the coat of arms of the late Lord Waverley, together with £100 will be awarded for the best essay of about 3,000 words describing a new scientific project or practical development, giving an outline of the scientific background, the experimental results and the potential application of the project or process in industry. The essays will be judged for technical content by specialists in the subject, for clarity of presentation and for style.

A second prize of £50 will be awarded and also a special prize of £50 for the best entry from a competitor under the age of 30 on July 31, 1960. If the first prize is awarded to a competitor under the age of 30, the special prize will go to the next best entry.

Research is this year introducing an additional competition the purpose of which is to interest candidates in the parameters which bear on practical problems and to draw their attention to the fact that " application in industry " brings in its train important and intellectually stimulating problems.

The competition is designed to draw attention to the difference between a purely scientific solution and a practical, commercially viable project. Mass production, economics, markets, social needs must all be taken into account.

For example, much is known today concerning human diet and deficiency syndromes but to supplement the diet of children in a remote community by adding fats and protein obtained by processing algae requires an appreciation of practical ways and means, including economic and social factors. Again, the development of mineral resources depends on the market value after the ores have been processed. This market value must take into account the supply of labour, transport facilities, and availability of capital.

Candidates, who must be practising scientists under the age of 30, are invited to write an essay of some 5,000 words. They should choose any new idea, concept or experimental result put forward in the recognised scientific literature in the last two years and discuss the commercial exploitation in the next decade.

The following is an example of what is in mind. The concept of negative effective mass of charge carriers in semiconductors has been introduced and the circumstances have been discussed. An essay might be written examining possible application to a commercial amplifier. This is, of course, merely an example, each candidate should choose his own

topic or subject for development. Each essay should contain relevant references.

The last date of entry for both these competitions is July 31, 1960. Further details may be obtained from the editor of *Research*, 4/5, Bell Yard, London, W.C.2.

EUROPEAN REFRIGERATED TRANSPORT BY RAILWAY

By DR. E. BAUMGARTNER

A PAPER on "European Refrigerated Transport by Railway" was delivered at a meeting of the Institute of Refrigeration, at the Institute of Marine Engineers, London, E.C.3, on March 3, by Dr. E. Baumgartner, of the Entrepots Frigorifiques de la Gare de Bale, S.A.

"Besides the technical problem of moving and switching wagons," said the speaker, "transport of perishables by rail depends on : (*a*) Special wagons, either with or without built-in cooling or heating equipment ; (*b*) a special organisation to supply the wagons as well as to maintain proper temperatures during transit, *e.g.*, by re-icing en route ; (*c*) the good condition and proper packing of products before loading ; and (*d*) a market for refrigerated transport by rail."

"First, I should like to discuss the last point concerning the use of refrigerated wagons without trying to find the answer to the old philosophical question : 'Which came first, the chicken or the egg ?' Obviously, if there would be no demand at all, no system of refrigerated transport would be necessary. Where the industry is not subsidized as is the case in central and western Europe, competition is an important factor for development. Some of the principal cost items for the owner of the wagon consist of loading, unloading and the time spent in the marshalling yards. These constitute constant costs for each transit regardless of its length ; therefore, the longer the run, the less the cost per kilometre or per mile. In large countries such as the United States or Russia, where long runs are quite common, these constant costs play a relatively small part in the total cost of transit, whereas the contrary is true in the 160 smaller countries of Europe.

"The 'Inland Transport Committee' of the 'Economic Commission for Europe' intensively studied the problem of transport of perishable foodstuffs. A committee of the I.I.R., presided over by Dr. J. Fidler, chairman of the technical board of the I.I.R., worked out a detailed report on this subject for the 'Inland Transport Committee', which has constituted the base of a brochure, entitled 'Transport of Perishable Foodstuffs,' published by UNO.

"Foodstuffs which, by reason of their physical, chemical and biological instability or which as a result of the cold treatment they have undergone, are sensitive to atmospheric conditions and particularly to temperature, require special precautions in the chain of operations from production to consumption, in order to prevent or limit the deterioration they may suffer.

Organization of the Service

"Taking into consideration the high cost of specialized rolling stock for refrigerated transport by rail, good management demands that the wagons remain constantly in the running for the transportation of perishables, except for the time necessary for routine overheads and repairs. The special knowledge of transportation requirements of the perishables industries—having the wagons at the disposal of the users whenever and wherever needed—is a business in itself. This implies a system of international controls whereby any wagon can be located at any given moment.

"The wagons have to be supplied to the users in due time and in good condition.

"The thermal properties of the wagons are specially important. This leads us to the problem of precooling. There are various kinds of precooling, either the wagon only, or only the goods to be carried, or both may be precooled. There are fixed installations and mobile equipment. The choice of the most appropriate method depends on economic factors. If a wagon of the UIC-ORE type is used, for example, one may precool the wagon by simply filling the ice-bunkers and letting the electric ventilation run by connecting the electric installation of the wagon with the local electricity supply. Then the goods can be loaded and precooled in the same way in the stationary wagons. If the demand for a certain perishable is very great and the wagon has to be dispatched immediately after loading, there will be no time available for precooling. In that case, all the necessary cooling has to be done during the run. As much ice will be used, the ice reserves of the car have to be renewed. This can best be done at the frontier-stations, as it is possible there to take advantage of the train stops for customs, phytopathological and railway inspections.

"In Western Europe, economical icing is an important point. The French system of ice towers offers an interesting solution for the problem of the mechanisation of the icing of refrigerator wagons. The ice is manufactured in the tower itself directly above the railway track, stored in a silo situated below the ice plant, and finally dropped into the icebunker of the wagon, by gravity.

"Up to now, however, it has not yet been possible to mechanize the re-icing to a sufficient degree, especially because the trap-doors of the ice-bunkers of the refrigerator wagons are arranged in different ways ; either they are fixed in the roof, in the side-walls or in the front-wall of the wagon. For the UIC-ORE type, a compromise solution has been found.

"The organizations which rent rolling stock can also advise the customers as to the type of refrigerator wagon best suited to their individual needs. The recommendations are given on basis of the various factors which influence the thermal behaviour of the shipment during the trip."

Refrigerated Transport in Europe Today

"The state of a transportation system can be described in terms of number of available cars, number of km covered by the loaded wagon or by the number of trips per year. According to the information given at the Congress for Refrigeration in Copenhagen, European refrigerated transport is developing very well. The railway administrations members of the Interfrigo and their affiliated companies dispose of the following wagons : Insulated wagons, 2,341 ; refrigerator wagons, 13,193 ; mechanically refrigerated wagons, 9 ; making a total of 15,543 units.

"Interfrigo, without counting the wagons supplied in inland traffic by the member—administrations of the Interfrigo and their affiliated companies—controls approximately 70,000 trips per year (in international traffic only). The traffic in refrigerator wagons in Italy is of special importance and showed in 1956 the following structure : Inland traffic, 34,865 trips ; export traffic, 86,558 trips, a total of 121,423 trips.

"In Sweden where the railway administration is not a member of Interfrigo, a considerable number of mechanically refrigerated wagons, and also a number of refrigerated trains, have been in operation for several years.

"Refrigerated traffic in Russia covers not only the European parts of Russia but also its Asiatic territory. Therefore in many cases very long distances have to be covered. In autumn and during the winter a considerable quantity of goods have to be transported in heated cars.

"Russian refrigerated trains, consisting of 23 four-axle cars, each have operated widely on the railways of the U.S.S.R. since 1953. These trains were built in the German Democratic Republic ordered by and in accordance with technical specifications of the Ministry of Railways of the U.S.S.R. Each train consists of 20 insulated wagons, a refrigerating machinery wagon, a wagon housing a diesel electric station and a wagon for the servicing personnel."

Conclusions

"Since the last world war transport of perishables by rail in Europe has developed considerably.

"This development will continue for various reasons :

1. By the fact that a steadily diminishing group of people will have to provide food for an ever increasing population, each group living far away from the other.
2. The standard of living will probably continue to rise.
3. The existing barriers in international trade will *gradually* be removed or become of lesser importance.
4. Transport by rail requires less human labour per ton than any other kind of transport.

"It is possible that in future for the transport of deep frozen products a greater use will be made of mechanically refrigerated wagons."

CHRYSLER
enters British market

CHRYSLER, the world's third largest manufacturer of cars and commercial vehicles is to enter the British refrigeration, air-conditioning, and heating field. Up till now, the company's main activity in the United Kingdom has been concentrated on the production of Dodge commercial vehicles and the marketing of Simca cars.

Announcing the expansion plans in London on May 25, Mr. Earl P. Lions, director of special products, Chrysler International S.A., Geneva, said that assembly lines had been laid down at Chrysler's Kew, Surrey, factory for the assembly of Chrysler-Airtemp refrigeration, air-conditioning and oil-fired heating units. This was the first stage of a programme aimed at building up British content in them to 50 per cent. and more.

Mr. Peter Richard Dyas, design and development engineer, Chrysler International S.A. (special products division), London.

Mr. John Henry Shearer, application engineer, Chrysler International S.A. (special products division), London.

The initial product line to be marketed by Chrysler in the United Kingdom consists of a selection of "condensing units" for commercial and industrial refrigeration, packaged air-conditioners, packaged liquid chillers, ranging from 1 h.p. to 100 h.p. and warm air furnaces in the 50,000 to 250,000 B.t.u./hr.

Mr. Sidney Frank Harrison, United Kingdom field engineer, Chrysler International S.A. (special products division), London.

Mr. Patrick O'Farrell, draughtsman/application engineer, Chrysler International S.A. (special products division), London.

range. Prices would be "extremely competitive," said Mr. Lion.

"Chrysler-Airtemp" has, for 25 years been a leader in the refrigeration, air-conditioning and heating fields in the United States.

Patents (*contd. from* 601).

Westaway, H. R., 839,475, Low temperature radiation pyrometers; Morrison, W. L., 839,380, Chilling of foodstuffs and the like; Gibson & Son Ltd., J., and Gray, D. D., 839,337, Refrigerators. 11—Coolmota Ltd., Owen, F. E., and Miller, F. L., 840,125, Refrigerators for cooling and cold storage; Vapor Heating Corporation, 840,416, Temperature control systems; Garrett Corporation, 840,218, Temperature control apparatus. 18—General Electric Co., 840,934, Magnetic latches suitable for refrigerators; Pressed Steel Co. Ltd., 840,855, Thermally insulated storage cabinets; Aero Pipe Glass Co. Ltd., 841,380, Refrigeration equipment; Dunham-Bush Ltd., 841,507, Refrigeration system and oil separator and muffler; Frosty-Glass Co., 841,270, Apparatus for individual refrigeration of glass vessels.

SHOP REFRIGERATION NEWS

Retail Review

Unusual Installations that may create Precedents

By Our Special Correspondent

I AM swinging back to small shops this month, partly to show that the supermarkets are by no means carrying everything before them, but more particularly because I have some unusually interesting examples of refrigerated display by individual retailers. Unusual, but likely, I think, to create precedents.

Mr. Robert Purkis of 125, Wood Street, Walthamstow, London, E.17, is the first retailer in this country to install a refrigerated cabinet of a new type that has come all the way from Michigan, U.S.A. It is significant that it is in a fishmonger's premises that this Sherer cabinet makes its début in England. Or should I not rather have said symptomatic ? It is a symptom of a general, if gradual, recognition by fishmongers of the fact that the shop of the slab-happy retailer who resists the advance of refrigeration is becoming an anachronism.

Made by the Sherer-Gillett Co. of Marshall, Mich., M. L. Winsor & Co. Ltd. has imported this cabinet which has the following characteristics : one-piece rigid steel frame, high-density insulation throughout of sandwich-type laminated closed-cell plastic, drain outlet in right-hand end with 1-in. pipe connexion. Standard finish is white, but the cabinets may be obtained in colour (yellow, coral, blue, or green) at extra cost. Cooling is by forced convection with controlled velocity. It is equipped for automatic defrosting : adjustment by time-clock. A dial-type thermometer is provided.

The length of the cabinet shown (p. 608) is 8 ft., a 12 ft. is also available, and the cabinets can be installed in continuous length. The capacity of the 8 ft. model is 12 c.ft., with a shelf area of 20 sq. ft. It has its own condensing assembly, operated in conjunction with a Sterne compressor.

Mr. Purkis, who formerly had an open-fronted shop equipped with two non-refrigerated slabs, has modernized his premises and now has an enclosed shop-front with facilities for window display. Service is given over the cabinet, and the customer has the option of selection from either the window or the refrigerated display.

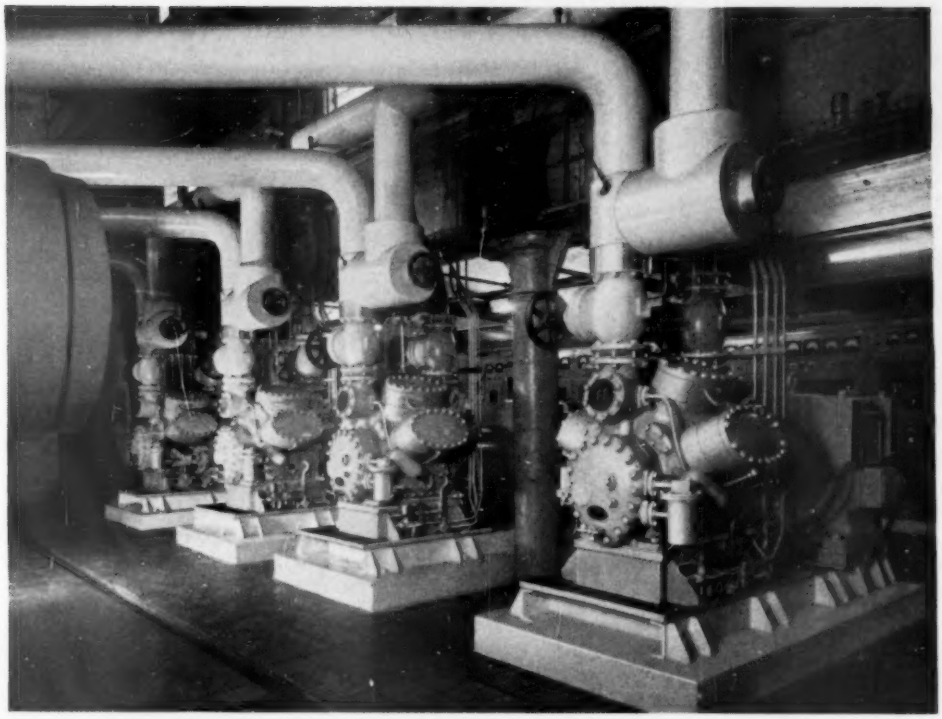
Facing the Sherer cabinet used for wet fish is an Iwo Frys cabinet for quick-frozen food. M. L. Winsor & Co. Ltd. are the U.K. distributors of both ranges, and the installation was carried out by Stevens & Smith of Epping, Essex.

The term " the deep-freeze " is frequently and, of course, quite erroneously, used as a description of the retailer's quick-frozen food cabinet. As a simple definition by the retailer it is an excusable lapse from verbal precision, though one to be discouraged. Used by the representatives of refrigeration plant and equipment manufacturers or distributors thereof, who should have a conscientious regard for precision in the terminology of their own industry, it is a reprehensible practice, because it encourages retailers to regard the quick-frozen food cabinet as a receptacle which can be used in an incidental way as a means of freezing fresh products.

One comes across the term in the advertisements of the manufacturers of frozen foods. That is deplorable

REFRIGERATION

for
manufacturing
processes



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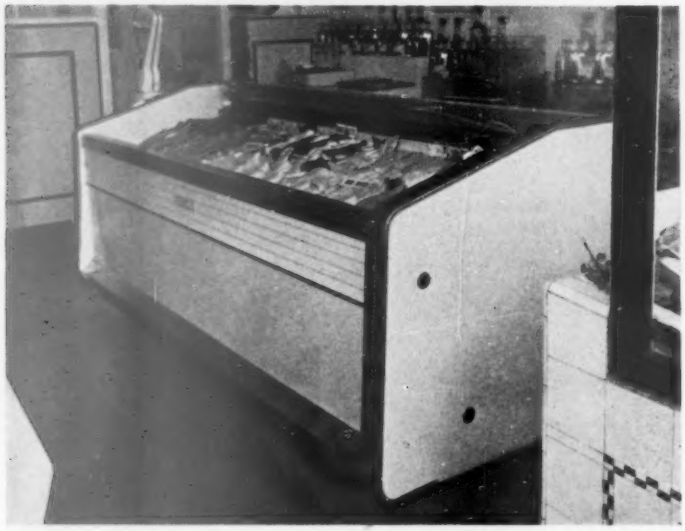
In brewing, for example, it plays a controlling part in all the processes. The illustration shows the four, 8-cylinder, 5" x 4" veebloc compressors, using ammonia as a refrigerant, supplied to Mann, Crossman & Paulin Ltd., Albion Brewery, London, E.C.1.

J. & E. Hall have supplied refrigerating equipment to all the leading manufacturers in the Brewing Industry.

AP 375

because it gives a touch of authenticity to what is in fact a misnomer, and further encourages the misuse of the cabinet by the retailer.

This all leads up to the fact that it may be advantageous for the retailer to use a deep-freeze cabinet (home-freezer or farm-freezer as they are alternatively called) as well as a quick-frozen food display cabinet.



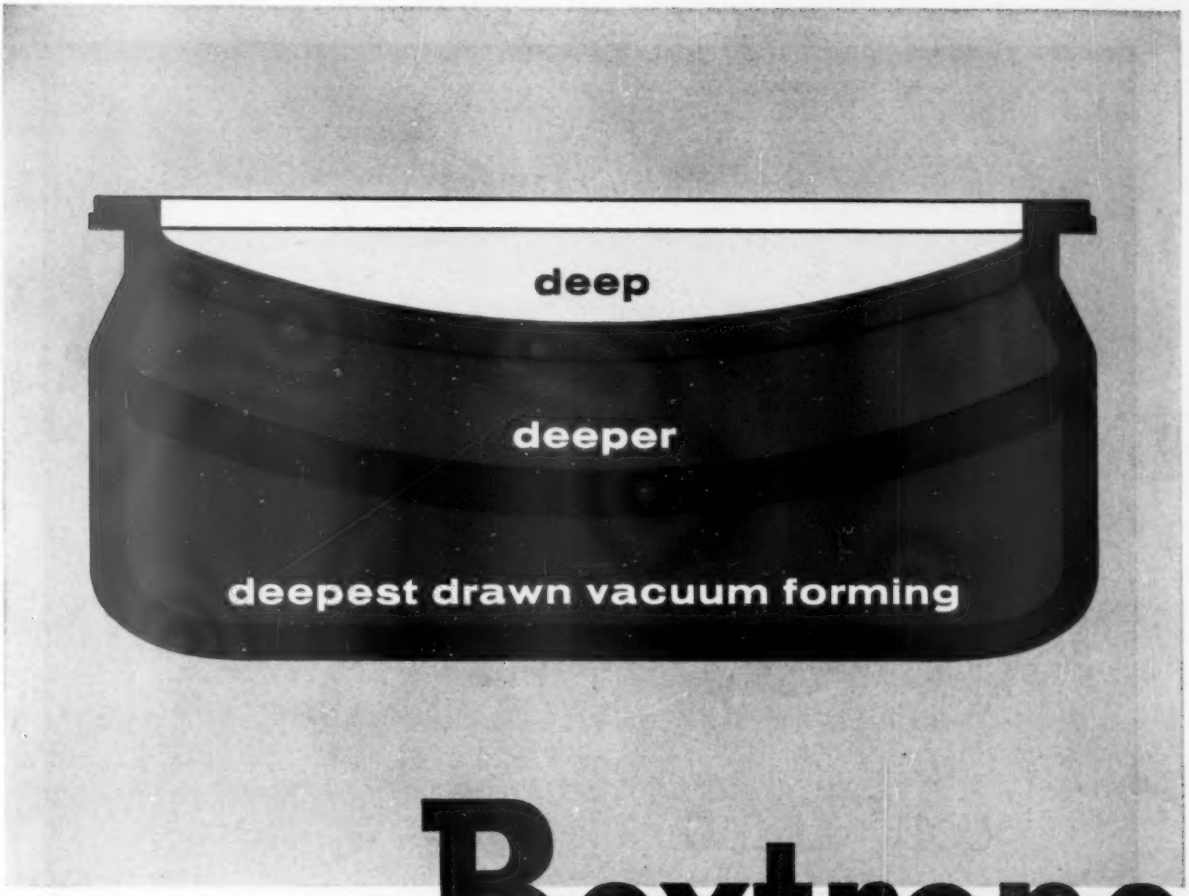
The first installation of a Sherer cabinet in Britain: at the shop of Mr. Robert Purkis, Wood Street, Walthamstow. The cabinet was obtained from M. L. Winsor & Co. Ltd., who have recently brought a number into this country.

One example of this combination is provided by a fishmonger's shop owned by Mr. F. Batchelor of Market Street, Maidenhead, Berks. He has a deep-freeze cabinet one side of which he uses to freeze and to store poultry and game, as well as a certain amount of fish. When I visited this shop recently, he had just taken in a stock of wood pigeons. These were being eviscerated, trussed, wrapped in grease-proof paper, and then placed in the deep-freeze cabinet. There was a blackboard outside the shop offering them at 2s. each.

They were being sold in this prepared and wrapped form from the deep-freeze cabinet. But those that were not sold that day could safely be kept in the cabinet, in a readily accessible position, for sale over possibly a period of weeks. The other side of the deep-freeze is used as a reserve store for quick-frozen foods, and from here the Sternette quick-frozen food cabinet on the right-hand side of the shop is replenished. The deep-freeze cabinet is a product of S. M. Wilmot & Co., Ltd. of Bristol. Both cabinets were installed by Ilco Ltd., Oxford.

There is no doubt at all that the quick-freezing industry will continue to advance, that still more

Cascade cabinets by Hussmann are being used for the first time for displaying meat, by Anthony Jackson Ltd. in their Clapham self-service shop.



Bextrene

SHEET for Frigidaire

From a flat Bextrene sheet to a deep Hydrator pan. Bextrene toughened polystyrene sheet has that third-dimensional reserve so essential for vacuum forming deep shapes with consistent ease. That's why The General Celluloid Company Ltd. chose tough, easy-forming Bextrene for making this Hydrator pan for the Frigidaire Division of General Motors Ltd. Extruded polystyrene sheets, rolls or panels in opaque colours are by far the most accommodating material for this thermoplastic technique. Write for leaflet and don't hesitate to deep-draw on the wide practical experience of the BX Plastics Technical Service.

BX PLASTICS LTD. *A Subsidiary of The British Xylonite Co. Ltd.*
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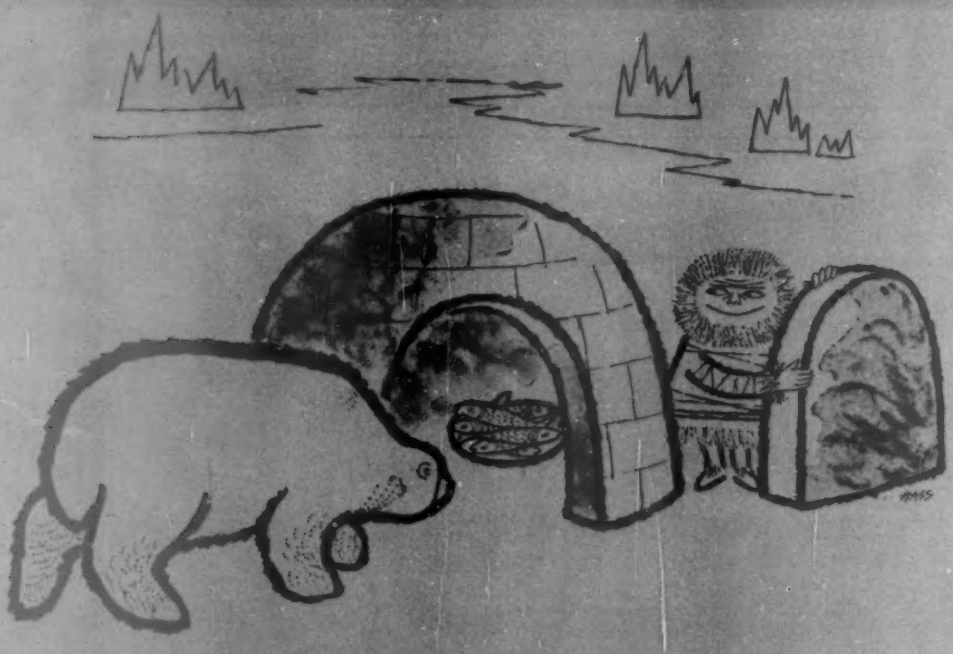


COLD LOGIC

When the problem is the lowering of temperature, it's a matter of cold logic to use 'Arcton' chlorofluorohydrocarbon refrigerants from I.C.I.— the first to introduce this type of refrigerant in Great Britain. (And the people with the greatest experience.)

Not that I.C.I. is resting on its laurels. Behind 'Arcton' refrigerants there's a background of constant research for further improvements. Wherever cooling is the problem, 'Arcton' refrigerants can provide the answer. They're of consistent high quality and low moisture content; and they're non-toxic, non-corrosive and non-inflammable. What's more, there's an 'Arcton' refrigerant to suit *your* need.

'ARCTON' REFRIGERANTS

IMPERIAL CHEMICAL INDUSTRIES LIMITED, LONDON, S.W.1

ICI

AR.51

varied kinds of foods will be quick-frozen, and that more brands will come into distribution. This continuing and relatively rapid progress makes it evident that there must be more space provided for frozen foods at retail level. The first step in that direction is the installation of a cabinet for reserve stock.

Frequently when a new cabinet is bought the displaced one is brought into use for reserve storage at the back of the shop. Suppliers of cabinets may have mixed views about this ; but, on the whole, it is good practice for, instead of buying the cheapest possible icecream conservator for the purpose and keeping the existing display cabinet in use in the shop although it may have become rather outmoded, the retailer who realizes that he can make that out-of-date cabinet serve a practical purpose out of sight behind the shop may feel more inclined to invest in a more modern cabinet for the shop.

I have just illustrated one way of providing reserve storage facilities : *i.e.* part accommodation in a deep-freeze cabinet. Here is another example.

This third installation to which I wish to direct special attention is probably more likely to create precedents because it makes use of hitherto wasted space. In the greengrocery shop of Mr. and Mrs. Shillingford at Hornchurch, Essex, I found the first retail installation of a vertical storage cabinet. This, brought out by Frigidaire six months ago, was designed primarily for caterers. It stands 6 ft. 3 in. high and has a base measurement of only 2 ft. 7 in. by 2 ft. 9 in. It thus saves floor space by making use of air space normally put to no use at all. It provides accommodation for 500 lb. of packaged frozen foods held at from 0 to –5° F. It was installed by Marketing & Maintenance Ltd., the Frigidaire distributors, of Brentwood, Essex.

This storage cabinet is used for replenishing stock in the display cabinet which occupies a prominent position on the open front of the shop, and both Mr. and Mrs. Shillingford speak enthusiastically about the time and trouble it saves.

In the Clapham branch of Anthony Jackson Ltd. (which is not a supermarket) Hussmann British Refrigeration Ltd. have installed one of their three-decker "Cascade" cabinets. Originally designed for the self-service display of provisions and dairy goods, these cabinets are in wide use for that purpose.

The vertical storage cabinet in the greengrocery shop of Mr. Shillingford at Hornchurch, Essex. This Frigidaire zero-store is the first installation by a retailer.

This is the first example of their use for meat and, judging by this installation, they are admirably suited to the purpose, though the top display of fruit juices in conjunction with meat seems to be singularly inappropriate. Surely if the top of a refrigerated cabinet must be used for display, a complementary accompaniment of sauces and pickles would be more appropriate.

SELF-SERVICE WITHIN SOUND OF BOW BELLS

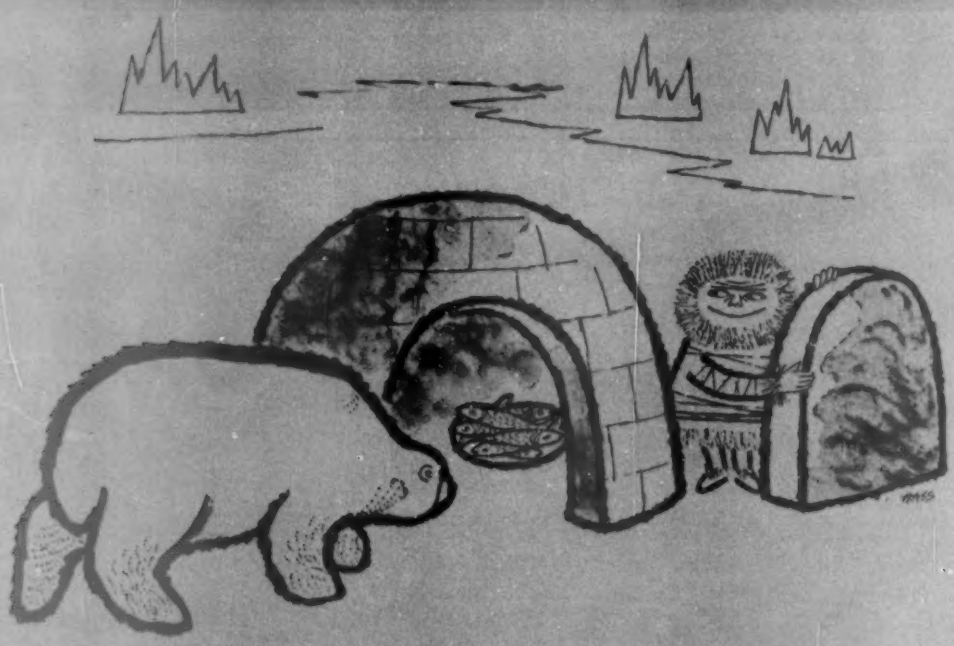
A MODERN self-service store has come to the ancient thoroughfare of Bread Street, which runs close by St. Mary-le-Bow, the church of Bow Bells fame, in the City of London.

Hudson Brothers, Ltd., the old-established City grocers, have equipped their Bread Street branch on the most up-to-date self-service lines with AeroPhreze Eezi-Serve display cabinets. Installation was by Asquith Refrigeration with Kelvinator equipment.

The three models in the Eezi-Serve range cover every self-service requirement. Model 105 is a frozen food sales case, a glass-panelled cabinet equipped with automatic defrost and working on the air flow principle. Occupying only 6 ft. by 2 ft. 6 in. of floor space, it has a nett capacity of no less than 11½ c.ft. An even temperature throughout the cabinet keeps valuable wares in first-class condition. Automatic defrosting means of course that there is no necessity to move the produce while defrosting is carried out.

Model 975 H provides the same sales advantages for provisions and fats at a temperature range of 35° to 45° F. Model 975 M is for pre-packed meat at a temperature range of 28° to 32° F.

Messrs. Hudson Brothers are one of many firms throughout the country who have found the answer



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Messrs. Hudson Brothers are one of many firms throughout the country who have found the answer

Self-service installation by Aero Pipe & Glass in the City of London.

to their self-service needs in these good-looking, craftsman-built Aero-Phreze cabinets.

The demand for AeroPhreze equipment has increased so rapidly that the manufacturers have recently moved to larger premises. All inquiries should now be sent to Aero Pipe & Glass Co. Ltd., High Street, Yiewsley, Middlesex. Telephone : West Drayton, W.E.3. 3251.

NEW SYSTEM FOR ICE PRODUCTION

THE development of a new system for the production of ice is reported from New York. It is claimed that the new system—" Ramos "—produces 25, 50 or 100 kilogram blocks of ice in two to three hours ; that floor space for the equipment is about one-fifth that required by normal equipment and that electrical energy is reduced about 10 per cent. Operation is so simplified that one man can produce as much as 100 tons per day.

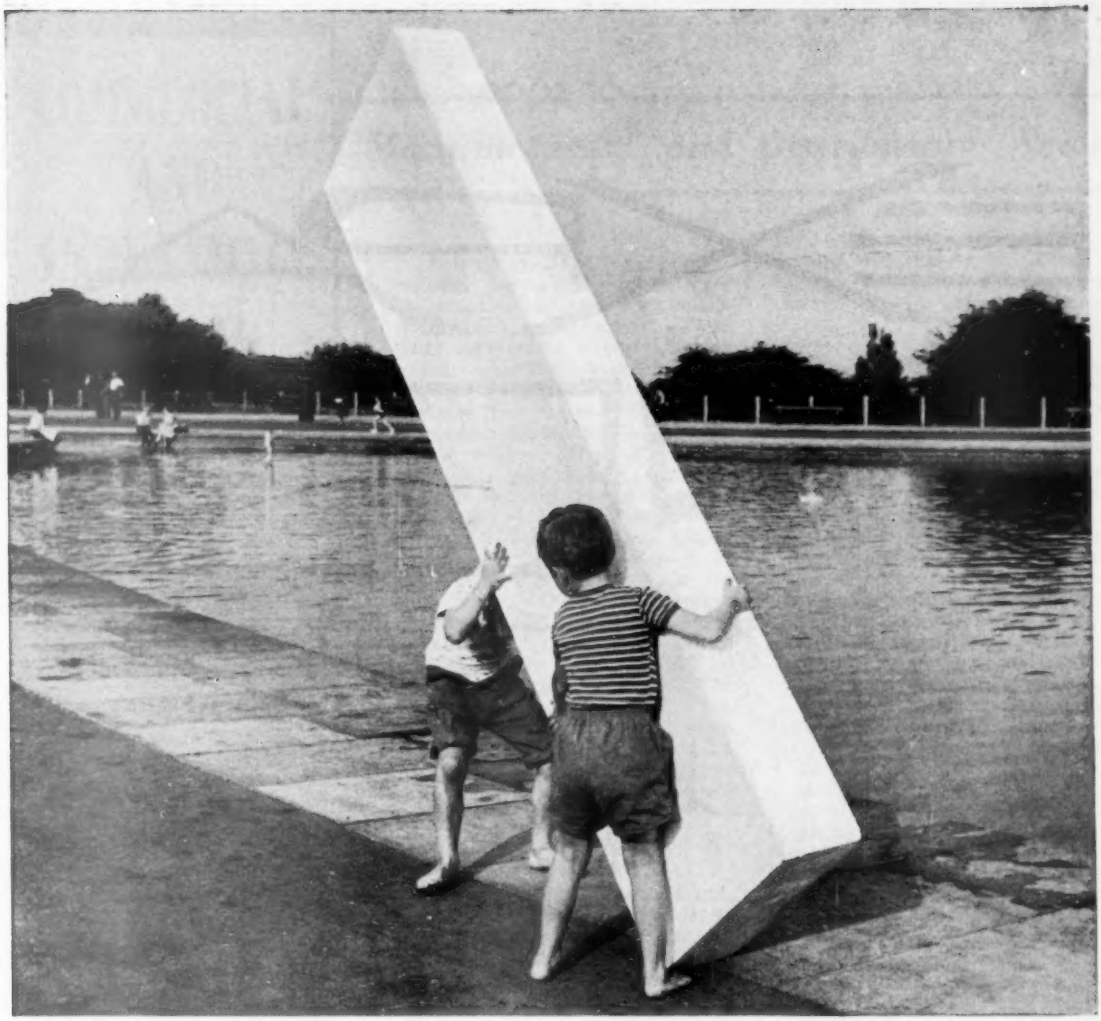
Delay in the formation of block ice using conventional methods is due to the fact that ice forms first on the surfaces of the moulds and freezes towards the centre of the block. The ice layer formed first acts to some degree as an insulator and slows up the formation of the ice towards the centre.

The " Ramos " system uses several rows of moulds of different sizes. Each mould represents one phase of the process. The system can include four or five phases depending on the weight of the ice block and the speed of production required. The core of the block is formed in mould No. 1, which is the smallest one, and the size of the block increases by steps by using gradually larger moulds wherein additional layers of ice are frozen on the block until the desired size is reached. By the use of this system it might be said that the block is frozen from the centre out instead of from the outside in. Thus the insulation effect of the ice shell is minimized.

Standard refrigeration equipment is being used with this system, employing either brine or direct expansion.

ALBRIGHT & WILSON LIMITED

SALES of the Albright & Wilson Ltd. group of companies totalled £34,500,000 in the year ending December 31, 1959. Net profit after tax and other deductions is £1,423,351. The comparable figures for 1958 are £32,200,000 and £1,070,197, respectively. In his annual report with the accounts of the company, the chairman, Mr. S. Barratt, states : " In all the countries in which we operate there have been forecasts of expansion in national production and trade in 1960. Nevertheless, we do not expect a large increase in the volume of our sales in the current year. The group has, through improved efficiency and economies, been placing itself in a stronger competitive position and much effort continues to be devoted to this end. It seems probable that profit margins will tend to narrow as a result of increases in some costs, notably labour costs, which are not likely to be sufficiently offset by lower prices for raw materials and services and will not be absorbed in higher selling prices."



Effective insulation is a question of balance

STYROCELL is a rigid, lightweight material consisting of a profusion of non-communicating air cells encased in polystyrene. By maintaining a fine balance between its weight and the volume of trapped air, STYROCELL provides a barrier of virtually still air—the ideal thermal insulant. In addition to its light weight—1 lb. per cubic foot—STYROCELL is inert, rot-proof and possesses a low water-vapour permeability, good mechanical strength, chemical resistance and electrical properties. Easy to handle and to work, STYROCELL is an inexpensive material that gives new meaning to effective thermal insulation. Available in either standard or self-extinguishing grades—in thicknesses from ½" - 10".

STYROCELL

Further details may be obtained from
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COMMERCIAL AND INDUSTRIAL SECTION

Manufacturers' and Distributors' News

Mr. G. L. Brown has been appointed to the board of Aero Pipe and Glass Co. Ltd. as sales director. Mr. Brown joined the firm in 1941 and

was appointed sales manager in 1947 since when the firm has become extremely well known in the refrigeration industry.

* * *

New showrooms devoted to the permanent exhibition of one of the largest ranges of industrial, portable and marine generating sets, pumps, marine engines, refrigeration compressor units and ancillary plant and equipment yet shown in Britain were opened last month in Norwich Road, Ipswich, by **G. M. Power Plant Co. Ltd.**, who are authorized distributors of Onan electric plants ; this range includes engine-compressors for refrigeration and air-conditioning.

Onan direct-coupled engine-compressors from Minneapolis were developed specifically for mobile refrigeration, air-conditioning and other applications where electricity is not a practical source of power. The Onan package derives its advantages from the mounting of the compressor directly to the crankcase of the engine. These advantages are higher performance, compactness, permanent alignment, longer life, lighter weight and elimination of parts requiring frequent adjustment and replacement. Many parts are interchangeable between the three series. The series comprises " AJ," of 5,000 to 15,000 B.t.u./hr capacities ; " LK," of 10,000 to 30,000 B.t.u./hr ; and " CCK," of 15,000 to 60,000 B.t.u./hr. The first-mentioned type uses Refrigerant-12 while the latter two employ Refrigerant-12 or Refrigerant-22. A Mann Egerton built refrigerated vehicle fitted with an Onan unit has recently been undergoing trials in the heat of Teheran.

* * *

The London Fan & Motor Co. Ltd., have acquired the total share capital of Batwin Electric Motors Limited, of Richmond, Surrey. This further expansion comes at a time when the factory of the London Fan & Motor Company is being extensively reorganized and re-equipped. It is anticipated that these moves will assist greatly in dealing with the continuously expanding volume of orders being received by both companies. To assist in the co-ordination of the newly associated companies, the offices of the London Fan & Motor Company are moving on June 1, 1960, to 331, Sandycombe Road, Richmond, Surrey (telephone : Richmond 0157).

* * *

The Distillers Co. Ltd., announces that **Mr. G. F. Ashford** has been appointed deputy chairman of the Chemical Group. **Mr. J. M. Rimington,** managing director of the Chemical Division, is retiring on this date for reasons of health after 30 years' service, and will be succeeded by **Mr. J. H. Dunn. Mr. J. S. Hunter** will succeed Mr. Dunn as assistant managing director (commercial) of the Chemical Division.

* * *

The production of a new Epok water soluble stoving primer resin A.1700 which has been developed as a vehicle for industrial stoving primers, is announced by **British Resin Products Ltd.,** Devonshire House, Piccadilly, London, W.1. The performance of the resin is comparable with that of conventional primer vehicles but it possesses several unique advantages because the usual conventional organic solvents are totally replaced by water. Moreover, this resin can be thinned to any extent with water alone. One of the outstanding advantages of this resin is that fire hazards are eliminated—an all important factor especially in fields such as motor car manufacture. Flame proof equipment is not required and insurance premiums can be reduced. Health risks are far less and the purchase of costly fume-extraction equipment can be minimized. Water is much cheaper than the cheapest organic solvent and does not have to be transported and stored in special compound form as do conventional thinners. Equipment is easily cleaned with water and costs are therefore correspondingly lower. Pigments disperse readily and by employing aqueous pigment lower milling times will be obtainable.

* * *

At the annual general meeting of the British Rubber and Plastics Belting Manufacturers' Association, held on April 27, 1960, **Mr. David D. Marshall,** of the Greengate and Irwell Rubber Co. Ltd., was re-elected Chairman for 1960–1.

* * *

Film Cooling Towers (1925) Ltd., Chancery House, Parkshot, Richmond, Surrey, have been informed by the Central Electricity Generating Board, that they have been awarded a large contract for three 4,800,000 gals. per hour natural draught cooling towers to be erected at Thorpe Marsh Power Station, near Don-

U N I V E R S A L

a complete range of Frozen Food Merchand-isers and Farm Freezers

illustrated is the

16.8 cu. ft. Farm Freezer

Retail Price **£135**

with

- Counter balanced lid
- Automatic interior light
- Key lock
- Storage baskets
- Finish—sparkling white Dulux
- Hermetic unit

Other examples from the Universal range :—

FARM FREEZERS

13.2 cu. ft. **£125**
21.7 cu. ft. **£155**

Glass-fronted DISPLAY MERCHANDISER

12.0 cu. ft. **£229**

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9 EVELYN HOUSE, 62 OXFORD STREET, LONDON W.1

UNIVERSAL COOLER COMPANY LIMITED
BARRIE · ONTARIO

caster. Each tower will be 350 ft. high. The value of the contract is in the region of £600,000.

* * *

The London Office of **Uddeholm Ltd.** has been moved to 78, Buckingham Gate, London, S.W.1 (Telephone: SULlivan 2741). The head office remains at Crown Works, Northwood Street, Birmingham, 3.

* * *

The Tempered Spring Co. Ltd., Sheffield, suppliers of springs for heavy and light industries for over 60 years, announce the setting up of manufacturing facilities for full-scale production of the Rollpin, a slotted cylindrical spring pin which replaces screws, rivets, solid pins, taper pins, hinge pins, etc. The Rollpin is easily driven into a hole where its own tension locks it into position. It is unaffected by movement or vibration yet may easily be drifted out if desired. Its slot dimensions, outside diameter and elastic limits are carefully precisioned so that the locking action is achieved in holes drilled to normal production tolerances. For ease of handling it is chamfered at both ends ; it will not tangle and may easily be adapted for automatic hopper feed. Its use simplifies production designs and reduces assembly costs. Heat-treated during production, the Rollpin has greater resilience and shear strength than the solid pin. Sizes at present available range from $\frac{1}{16}$ in. to $\frac{1}{2}$ in. in diameter.

* * *

The Cambridge Instrument Co. Ltd., Friern Park, North Finchley, London, N.12, have recently issued their List 176, describing a range of thermometer regulators which are immediately available from stock. These models have already proved their worth by controlling accurately and reliably a great number of processes which are either heated or cooled by gas or electricity. " For a very small initial outlay," states the company, " they bring the reliability and economy of automation control to boilers, refrigerating and ventilation plant, furnaces, ovens etc." Robust and quite simply installed, the regulators available include all temperatures from −10° to 100° F. and 0° to 600° C.

* * *

The Distillers Co. Ltd., chemical division, announces that due to recent extensions of plant capacity and improved processing techniques, the price of Isophorone is reduced as from May 9, 1960. The reductions range from £10 to £14 per ton dependent on quantity and typical prices are : 1-ton lots in drums £225 (old price £237), 10-ton lots in drums £221 (£235), 10-ton lots in bulk £217 (£231).

* * *

The formation of an Italian subsidiary—**Ether Langham Thompson (Italiana) Ltd.**—has been announced by Ether Langham Thompson Ltd., Caxton Way, Stevenage, Herts. The subsidiary's address is Via Bisleri 19, Milan.

* * *

Mr. K. J. Gibbons has been appointed publicity manager for the Sunbury group of companies comprising : Teddington Industrial Equipment Ltd., P. W. Baker & Sons (Sales) Ltd., and P. W. Baker & Sons Ltd. The group is controlled by the British Thermostat Co. Ltd., of Windmill Road, Sunbury-on-Thames. Mr. Gibbons was previously with the research laboratories of English Electric, the publicity department of Ruston & Hornsby Ltd., and the Alenco group of companies. He is an experienced film producer and photographer.

* * *

Shell Chemical Company's plastics division announce the appointment of **Mr. A. Glyn Owen** to their special products and marketing services department, as sales

Mr. A. Glyn Owen

manager for " Styrocell " expanded polystyrene. In this role he will also be responsible for developing new markets and applications. Mr. Owen, an associate of the Institute of Refrigeration, is already well known in the thermal insulation field. He took an Honours Degree at Dublin University in 1952 and among other activities he is a part-time lecturer at the National College of Heating, Ventilating, Refrigeration and Fan Engineering.

* * *

The Reddish Chemical Co. Ltd., of Cheadle Hulme, Cheadle, Cheshire, by arrangement with F. W. Berk & Co. Ltd., have been appointed as sole distributors of Marinol industrial bactericide. This product is manufactured by Leda Chemicals Ltd., of Edmonton, London. Mr. W. J. Hipkins, managing director of the Reddish Chemical Co. Ltd., announcing the new move, said that this would add a proved quaternary ammonium compound to the Reddish range of products. Marinol will be distributed in one- or five-gallon polythene bottles which are non-returnable. The larger quantities will be delivered by the company's own transport and smaller quantities forwarded by passenger train.

* * *

An agreement has been concluded between **Hutchison & Co. (Glasgow) Ltd.** and their subsidiary, H. A. Harben & Co. Ltd. and Drammens Jern of Norway to manufacture and market refrigeration equipment in the Outer Seven area. A new company has been formed jointly under the name of A.I.R. Ltd. with particular interest in the marine refrigeration field. With the Outer Seven market pending, the negotiations have been concerned to give the companies complete coverage of the major shipbuilding and marine countries of Europe. They will be able to handle all repair work at the ports in the various participating countries and will also be able to quote for new work in the refrigeration, heating and air conditioning field. Managing director of the new company is Mr. R. A. Robertson chairman of the R. & J. Syndicate of companies of which Hutchison & Co. (Glasgow) Ltd. is a member. Chairman of the company is J. E. Alexander, London and Liverpool shipowner. Hutchison & Co. have been traditionally interested in the metal fabrication field for the shipbuilding industry so that this development is a further expansion of that interest. In January they acquired H. A. Harben & Co. Ltd. of Wallasey, who are in the same field, and they then announced plans for expansion of their joint interests in the atomic, insulation and oil industries. The proposals for co-operation with Drammens Jern, one of the largest refrigeration

companies in Norway will mean expansion of the firm's work in Glasgow.

* * *

This storage jar, blow-moulded to resemble a small cask, has a capacity of 3 kgm. and is fitted with a screw-on lid. It is produced by Per Thorkildsen Plasticindustri, of Hauketo, near Oslo, Norway, using Rigidex high-density polythene (Type 9) and is available for a variety of packaging purposes, where it offers a combination of very useful properties. The jar is rigid, virtually unbreakable and resistant to oils, fats, greases and to most solvents and chemicals while the good temperature resistance of Rigidex enables the jar to be sterilized in boiling water. The picture shows the jar in use for packaging raspberry jam (" Bringebaersyltetøy ") by Loiten, producers

of famous Norwegian spirit, "Loitens Akevitt." The jar is white, with a red lid and lettering in vermilion, brown and bronze printed on the jar by a silk screen process. Rigidex is manufactured by **British Resin Products** Ltd., Devonshire House, Piccadilly, London, W.1.

* * *

British Resin Products Ltd., announce that **Mr. G. F. Prescott** has been appointed a director of the company.

* * *

A. Y. Grozbord, the newly-appointed president of Gilson Manufacturing Co. Ltd., in Canada, arrived in London in late April to begin trade with United Kingdon purchasers and component manufacturers. The 29-year-old chief executive will discuss development of his manufacturing concern's Commonwealth business. Its main markets outside Canada now are the British West Indies and British

A. Y. Grozbord

Guiana. Mr. Grozbord was associated with Universal Cooler Company, Barrie, Ontario, as vice-president before his appointment at Gilson. Within the past few weeks he has created a new engineering department, whose first result was a completely re-designed freezer to suit the needs of English homes. The Gilson Company manufactures domestic refrigerators, freezers, furnaces, burners, electric washers and ranges, chair fixtures and many other domestic and industrial products. Mr. Grozbord heads a company founded in 1907. Its head offices and factories are centered in Ontario's industrial belt, accessible to all markets by truck, rail or water.

* * *

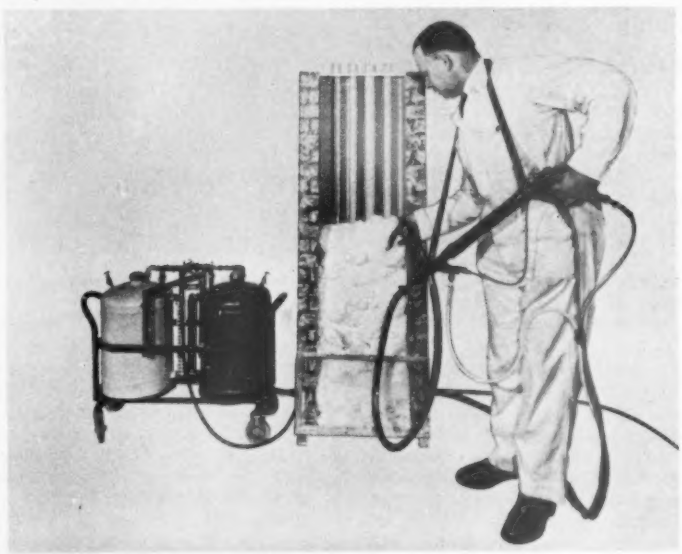
***In Situ* Insulation with "Jablinsul."**

The technical properties of " Jablinsul " have interested both the refrigeration and building trades in recent months.

Desirable features sought for in an insulant are thermal efficiency and non-inflammability. It is also desirable that the insulant should be non-corrosive, light in weight and resistant to shaking under vibration. Other properties are absence of odour and immunity to organic deterioration. " Jablinsul " fulfils all of these requirements and and adds the important factors of low cost and ease of application.

" Jablinsul " differs from other foaming methods in that the material emerges under pneumatic pressure from the foaming device (pistol) already catalyzed. In a semi-fluid condition, " Jablinsul " is forced into the cavities to be insulated. This ensures that completely foamed material is introduced to every corner of the cavity in a consistent, continuous quality. The engineer, therefore, knows with certainty that the cavity is uniformly efficient in regard to its insulation. Free foaming in cavities obtained by adding the constituents to a structural cavity and using the cavity as a mixing chamber cannot ensure this.

There appears to be no limit to the service of the material at low temperature as under tests in boiling nitrogen (–196° C.), no brittleness results. A technical bulletin on " Jablinsul " is available and Messrs. Jablo Plastics supply the chemicals and manufacture the foaming equipment which is available on a hire basis.



Monsanto

LUSTREX T3

Complete interior linings moulded by Ekco Plastics Limited for Frigidaire Division of General Motors Limited.

Lustrex Toughened 3, in common with all other grades of Monsanto Lustrex, is a HIGH-QUALITY polystyrene. Coupled with its unique advantages of great strength and excellent surface finish—better than any other toughened polystyrene—this makes Lustrex T3 the natural choice for refrigerator linings.

*Lustrex T3 is available in a wide range of standard colours. Special colours can be accurately matched within a few days.

*There is a grade of Lustrex for *every* job in polystyrene.

**Lustrex is a Registered Trade Mark.*

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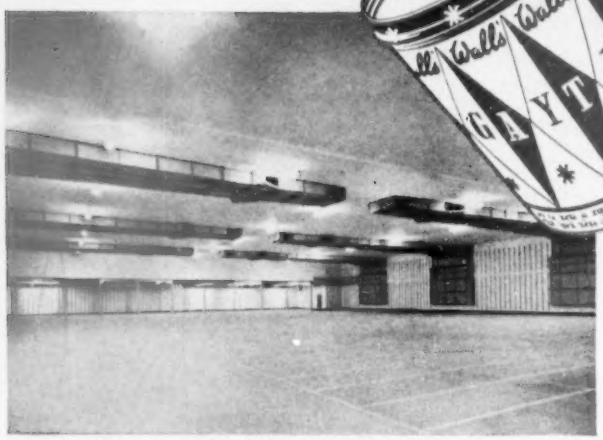
Wall's ICE CREAM

again choose

LIGHTFOOT

Refrigeration...



Photographs by courtesy of T. Wall & Son (Ice Cream) Ltd.

for their huge new factory at Gloucester which, when completed, will be the most advanced ice cream production unit in the world.

The first phase of this new project was completed when the 600,000 cu. ft. ice cream storage room, seen in our left hand illustration, was put into operation recently. This room is cooled by ducted air circulation and is served by 20 steel finned, Glycol Defrost Coolers and 6, semi-radial, Model A56 Compressors.

During sixty years of association, Lightfoot have supplied refrigeration equipment to this famous company, for over 100 cold stores including the 300,000 cu. ft. room at Craigmillar, Edinburgh and the new Acton Cold Store of 430,000 cu. ft.

THE LIGHTFOOT REFRIGERATION CO. LTD. ABBEYDALE RD. WEMBLEY, MIDDX. *Tel: PERivale 3322*

LIGHTFOOT
REFRIGERATION

NEW MANCHESTER COLD STORE

for

M.B.T. FROZEN FOODS LIMITED

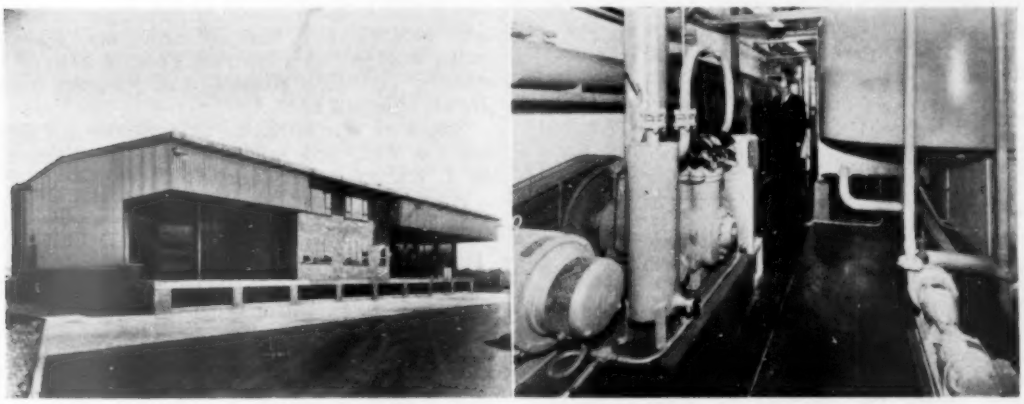
Mr. Reg Dixon, who performed the opening ceremony, "breaking the ice."

TO meet a rapidly increasing demand for frozen foods in the north midlands and the north of England, a new 57,500 c.ft. cold store and depot was opened at Woodsend Estate, Flixton, Manchester, on Thursday, May 5, by M.B.T. Frozen Foods, Limited, Preston. The opening ceremony was performed by Mr. Reg Dixon, the T.V. and radio personality.

The store was designed and constructed by Smiths Insulations, Limited, Burton-on-Trent, and has internal dimensions of 100 ft. long × 40 ft. wide × 14 ft. 4 in. high, in front of which is a 10 ft. wide loading bay capable of accommodating several vehicles at once. Offices are included in the building.

Refrigeration plant, supplied and installed by the Lightfoot Refrigeration Company, Limited, comprises two No. 8 "Freon" compressors of 20 h.p. working in conjunction with eight forced air evaporators each with two 18-in. fans. Automatic defrosting is being operated and the installation includes a Heenan-Marley No. 303 Aquatower water re-cooler. The operating temperature is −5° F. but the plant is capable of lower temperatures if necessary.

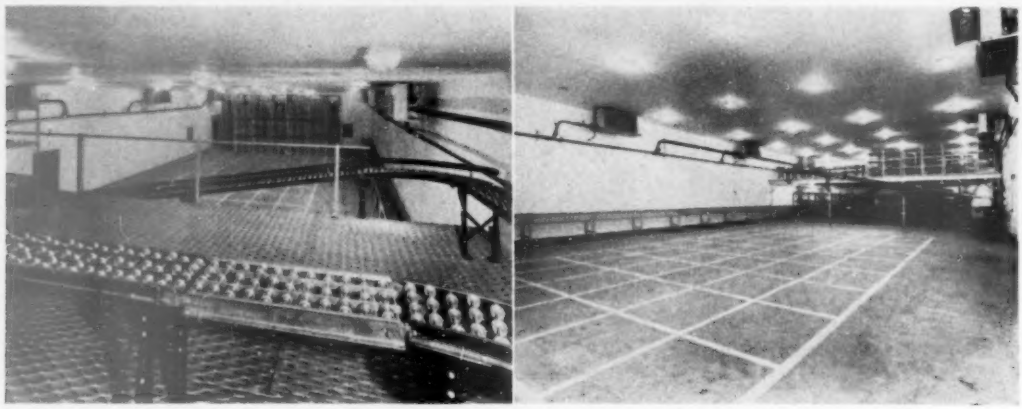
The depot is designed to use mechanical handling wherever possible, and to achieve this both palletization, with the help of a fork lift reach truck, and conveyors, horizontal belt, inclined belts and gravity wheel, have been used in varous forms. The east part of the store is for bulk and reserve storage, whilst at the west end a mezzanine floor has been



Exterior view of the store showing its loading bays and office section. Pictured in the store's engine room (right) is Mr. B. T. Smith, of Smith's Insulation, Limited, Burton-on-Trent.

installed to allow sufficient space to store the quantities normally required for weekly distribution, with space to pre-assemble at least four van loads for speedy loading. Urgent orders may also be made up on trolleys and loaded via the personnel door.

The main door, which is 5 ft. wide × 6 ft. 11 in. high, enables the fork lift to enter the store and allows the use of hand pallet trucks to discharge loads already palletized from special road containers or AF.P. rail containers. It is planned that normal loads not palletized should be off loaded into the cold store through an insulated hatch near the rear of the east wall, from which place a Fisholow horizontal belt conveyor runs the full length of the store with automatic transference to an inclined belt conveyor of those goods destined for storage on top of the mezzanine. The storage in the flow racks will be maintained either by fresh supplies or by taking a pallet load out of the reserve stock.



Views from opposite ends of the store showing order assembly conveyers on the upper mezzanine. The intake conveyer runs along the left wall in the right-hand illustration.

Flow Rack Containers

The depot is basically designed to permit easy and speedy assembling and despatch of orders both for the retail and catering trades, and to achieve this some 50/60 of the varieties most in demand will be stored on flow rack conveyors so that the order assembler need only take these commodities from the end of the racks. The cases are placed on an inclined gravity wheel conveyor as they are taken out of the flow racks, which automatically transfers them to an inclined belt conveyor feeding the storage conveyors on top of the mezzanine. Here, two normal loads may be assembled still on the gravity wheel conveyors which descend through the mezzanine and, by connecting a piece of mobile conveyor, the goods flow out through the insulated hatches into the awaiting delivery vehicles.

M.B.T. Frozen Foods, Limited, effects deliveries to retailers and caterers, including hospital and industrial canteens, by their own insulated or refrigerated vehicles in an area covering from Stoke to Carlisle. Normally orders are obtained by representatives based on a weekly call, but an increasing number of customers now also telephone in additional orders. The company abandoned van sales many years ago as being out of date with the present development of the trade.

The initials M.B.T. are those of the parent company, Miller, Ball & Toulmin, Ltd., of Preston. This company was itself an amalgamation of two old established Lancashire Cheese Factors—Miller & Ball and Livesey & Toulmin, which was established in 1816.

Trading in quick frozen foods commenced as soon as supplies became available in this country after the war in 1948, and in 1952 M.B.T. Frozen Foods, Ltd. was incorporated. The company's first cold store at Christian Road, Preston, has been enlarged several times and a depot at Manchester was opened in 1950, with subsequent depots at Blackpool and Ulverston in 1956.

The company's distribution area includes the four large holiday resorts of Southport, Lytham St. Annes, Blackpool and Morecambe, as well as many smaller ones.

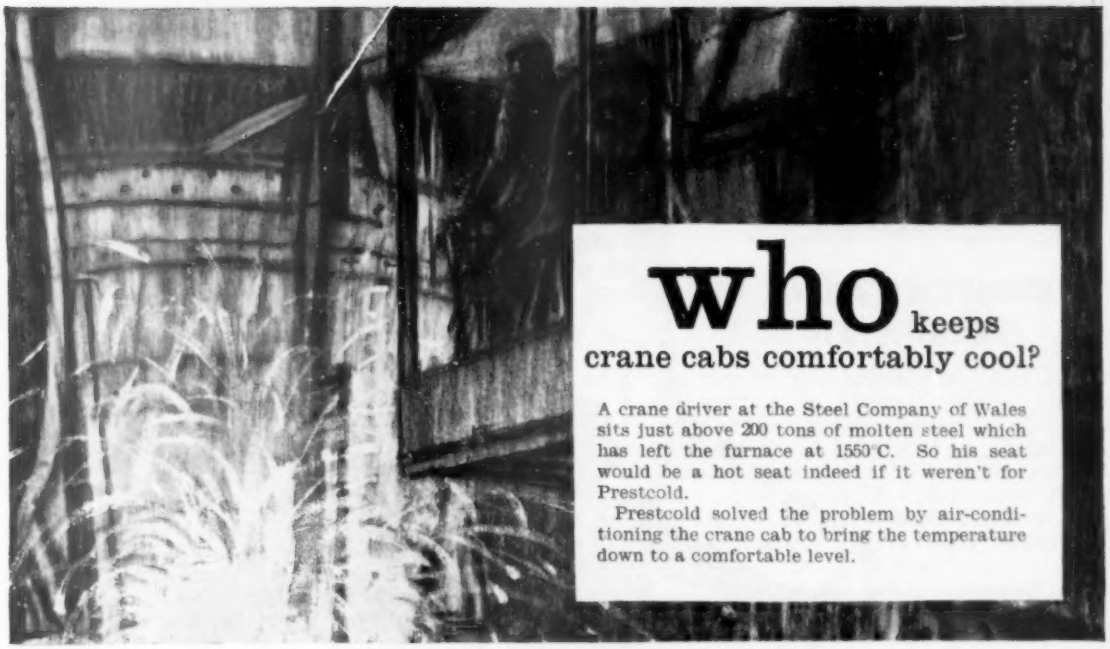
The fork lift truck was supplied by Lansing, Bagnall, Ltd.; pallets, J. Cutler of Grimsby; pallet convertor, J. C. Youngman, Ltd.; horizontal belt conveyor, Fisher and Ludlow, of Birmingham; flow rack and inclined and wheeled conveyors, Rapidstan; pallet storage racks, Bertram Thomas, Ltd. of Manchester, and Kee Klamps, Ltd.; storage racking, Handy Angle, Ltd.

Steelwork was by Burton Construction & Engineering Co. Ltd., and brickwork and site construction by J. Walton, Ltd., Salford.

Architects were Benjamin Waterhouse & Co., Manchester.

Technical Progress News

A new publication "Technical Progress News" dealing with insulation matters, has been launched by the Cape Asbestos Company, Limited, 114-116 Park Street, London, W.1. The company manufactures the widely used "Rocksil" and "Caposite" materials.



who keeps crane cabs comfortably cool?

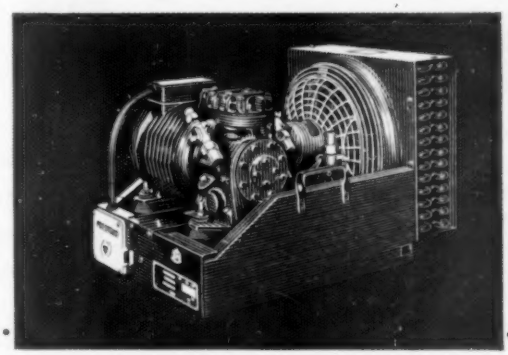
A crane driver at the Steel Company of Wales sits just above 200 tons of molten steel which has left the furnace at 1550°C. So his seat would be a hot seat indeed if it weren't for Prestcold.

Prestcold solved the problem by air-conditioning the crane cab to bring the temperature down to a comfortable level.

How Prestcold research keeps milk fresh in bulk

When milk is collected in bulk from farms by means of road tankers, there is a considerable saving in labour and transport costs. Reliable and efficient refrigeration equipment is used to cool the milk rapidly and store it at 40°F till it's collected by the road tanker. Prestcold equipment is at the English Milk Marketing Board's initial scheme at Newbury, and was used exclusively for the first extensive Bulk Milk Collection scheme in the United Kingdom.

The Super Presmetic direct-drive motor compressor is an outstandingly reliable way of refrigerating, because its design simply does away with the parts that could cause serious trouble. It's hermetic, yet it can be serviced where it stands. It's economical, giving you more refrigeration per unit than ever before. It's guaranteed for five years. It's made by Prestcold—makers of the largest range of commercial refrigeration equipment in the country. For full details, post the coupon now. (There's a Prestcold Branch or Agent in your area.)



FOR FRESH IDEAS...ITS

Prestcold

To: Commercial Sales Department, Prestcold, Cowley, Oxford

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need
to stretch?

Business never stands still. New business, new methods, new techniques, new competition—all these mean that new plant and equipment are forever needed. That's where UDT comes in. UDT helps you replace old equipment, add new, out of income. Which often means it pays for itself out of increased profits. A nice businesslike way to do business. If you think UDT could help you, get in touch with the Manager of your nearest UDT office—the address is in your local directory.

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SEMI-FREEZER TRAWLER

SOME of the latest developments which will help the fishing industry—still largely a non-scientific industry—to reap the benefits of modern research and provide a plentiful supply of fresh fish all the year round were discussed last month at the research station at Torry, Aberdeen, of the Department of Scientific and Industrial Research.

Dr. G. A. Reay, superintendent of the station, said that he could see new methods coming along in a few years' time which would solve the problems of glut and scarcity in the fishing industry. With quality control and testing, batch production techniques would be adopted and " even small-scale mechanization might be expected in the treatment of fish," he said.

The most impressive proposal, based on work done at the station on quick-frozen and cold stored fish (at minus 29° C.), is for a new type of " semi-freezer " trawler which, though slower than most modern vessels, would be able to stay at sea longer and return to port with a much larger proportion of fish in first-class condition. Scientific experiments have shown the system to be feasible and design and economic studies suggest that it is commercially practicable. Details of the new trawler are to be announced shortly.

One of the most pressing problems the industry has to solve to-day is concerned with the thawing out of fish frozen after landing (it would apply equally to fish frozen at sea), and a dielectric thawing technique has recently been developed at the Torry research station which reduces the normal thawing time of 12 hours for herrings to 15 minutes.

Large blocks of frozen cod and other white fish take up to three days; but by the new process thawing can be achieved in 75 minutes. This prototype equipment suggests the possibility of central thawing stations in industrial centres far from the fishing ports to which hard frozen fish would be sent for storage and subsequent thawing to provide sea-fresh fish

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BALFOUR ACQUIRE WILMOT REFRIGERATION

The refrigeration division of S. M. Wilmot and Company, Limited, has been taken over by the Balfour Group of companies. The change took effect on May 1.

Balfour (Marine) Engineering Co. Ltd., is an old established organization specializing in the manufacture of components, jigs, fixtures and fabricated assemblies for the aircraft industry of Great Britain. Other companies in this organization, which covers almost every facet in engineering, specialize in nuclear engineering production and fabrications of an intricate nature, electronic engineering producing electro-mechanical mechanisms of a complex nature, tool, gauge and pattern manufacture, and general precision woodworking employing the latest techniques and equipment in one of the largest and most up-to-date plants in the country.

All correspondence should be addressed to Balfour (Marine) Engineering Company, Limited, 290-296 High Road, Ilford, Essex. The Bristol and London offices of S. M. Wilmot and Company Limited are now non-operative.

UPRIGHT CABINET DEFENDED BY U.S. STORE-OWNER

THE case for the upright frozen food case was presented in the February issue of *NARGUS Bulletin*, the monthly magazine of National Association of Retail Grocers of the United States, whose members operate 112,000 stores throughout the nation. An article by Glen Silverthorne, president of " Tops All Markets," Portland, Oregon, compared a 14-door upright case used in one of his stores with a conventional frozen food case in another, on the basis of convenience, sales, maintenance, and operating cost.

The upright case occupied 120 sq. ft. of space, and had a 280 c.ft. capacity, while the conventional case occupied 228 sq. ft., with only 180 c.ft. The ratio of frozen food sales from the upright case exceeded the conventional case by 17 per cent., Silverthorne said. He reported that his staff found the upright case easier to stock, and mentioned that in case repairs were necessary, a comparatively small quantity of merchandise would have to be removed.

In a comparison of operating costs, Silverthorne found that the upright case used six horsepower as against nine horsepower for the open case. Defrosting cycle was eight minutes for the upright reach-in case compared with 30 minutes defrosting time for the conventional case, he said.

The upright cases held the same amount of merchandise in 30 lineal feet as was contained in 57 feet of lineal space occupied by open cases in the store used for comparison. Heated doors, he said, were warm to touch, free from condensation, and easy to open.

UNITED AIR COIL APPOINTMENT

United Air Coil Ltd. have appointed Mr. Frederick J. Rolt, A.M.I.H.V.E., as senior engineer in charge of research and development work on heat transfer equipment and a steadily increasing range of new products.

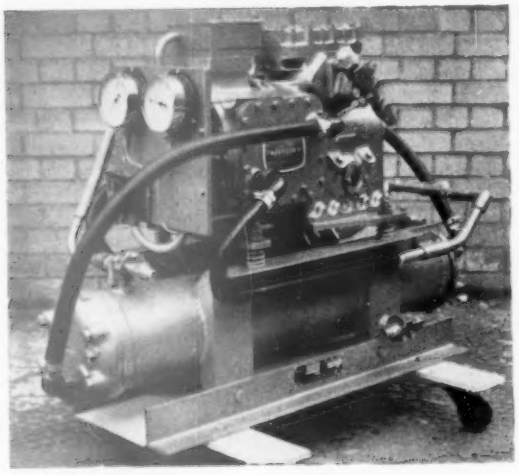
FITCH LOVELL EXPANSION

Fitch Lovell Ltd., announce that they have acquired the assets and trading name of the Southwark Bacon Drying Co., in order to strengthen the group's service arrangements.

New Range of Condensing Units Developed

PRESTCOLD'S 3-CYLINDER MACHINES

A NEW range of water-cooled condensing units fitted with resiliently mounted 3-cylinder Super Presmetic power units guaranteed for five years, is now being manufactured by the Prestcold Division of the Pressed Steel Company Limited. Three basic models are available—W.S. 400, W.S. 500, and W.S. 600. An interesting feature of the design is that the motor is coupled direct to the compressor, with the stator mounted in a well-finned housing cast integrally with the compressor body. Quiet and almost vibration free operation is provided by flexible



Prestcold water-cooled condensing unit.

rubber and spring mountings on the base frame. The compressor is fitted with self-resetting thermal overload cut-out, and single-phase protection within the starter is achieved with self-resetting quick-trips.

The water-cooled condenser, which is horizontally mounted beneath the motor-compressor, is designed for high thermal efficiency and low water pressure drop. Where the condenser/receiver is to be located remote from the motor-compressor, water and refrigerant piping are arranged to suit, and the motor-compressor is resiliently mounted on a special base frame. The condenser tubes are of refrigeration quality finned copper, housed in a seamless steel shell. Refrigerant shut-off valves are fitted at both the inlet and outlet positions of the condenser/receiver. Sound design ensures maximum refrigeration duty in the minimum space.

Designed for automatic operation these units have a cut-out switch to guard against damage by high pressure. Provision is made on the control panel for fitting a low pressure cut-out switch and the necessary low pressure connexion on the motor-compressor. The switch, complete with its fittings, may be obtained as an optional extra.

Technical data is as follows :—

Condensing Unit	Horse Power	Bore	Stroke
WS. 400 H	4	2 in. (3 cyl.)	2 in.
WS. 400 L	4	2 $\frac{3}{16}$ in. (3 cyl.)	2 in.
WS. 500 H	5	2 $\frac{7}{16}$ in. (3 cyl.)	2 in.
WS. 500 L	5	2$\frac{3}{8}$ in. (3 cyl.)	2 in.
WS. 600 H	6	2$\frac{3}{8}$ in. (3 cyl.)	2 in.

Suction pipe size, 1$\frac{1}{2}$ in. nominal bore; suction connexion, 1$\frac{1}{4}$ in. Yorkshire adaptor; discharge pipe size, $\frac{3}{4}$ in. O/D; discharge flare nut, 1 $\frac{1}{16}$ in. SAE; liquid receiver flare nut, $\frac{3}{4}$ in. SAE (flare nut for $\frac{1}{2}$ in. O/D tube provided); water connexions, inlet $\frac{3}{4}$ in. BSP—outlet 1 in. BSP; refrigerant—factory charge, 1 lb.; refrigerant—pump-down capacity: 38 lb. Refrigerant 12; oil charge, 6 pints; evaporating temperature range, low back pressure application up to 0° F.—high back pressure application 0° F. to 45° F.; net weight, approx. 700 lb.

The 3-cylinder motor-compressors are fitted with 3-phase squirrel cage motors running at 1,450 r.p.m. All nuts and bolts are in accordance with the unified thread series (British Standard Specification 1580 : 1953).

Three new leaflets have been released recently by B. X. Plastics Limited, Higham Station Avenue, Chingford, London, E.4. Two of these : " Service in the Midlands " and " Service in Scotland " refer to the newly opened depots in those areas and the services they provide. The third—" So yours is a Tough Problem "—covers the " Bextrene " toughened polystyrene range of plastics materials specially designed for applications where extra toughness is required.

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SHIP LOADING SIMPLIFIED

RECENTLY, the first all-container cargo vessel to go into service in the Pacific made her maiden voyage from San Francisco to Honolulu, Hawaii. The vessel, formerly a conventional C-3 freighter, has been converted by the Matson Navigation Company in the U.S. to carry 296 aluminium cargo containers and 72 refrigerated containers.

These containers undergo only two handling operations from dockside to dockside, loading and unloading, in contrast with the half dozen or more involved in regular cargo shipment. On a special chassis, the container forms an over-the-road unit for haulage between shipper, freight stations, marshalling yards and terminals. It is lifted on and off the ship by means of a special, electronically controlled gantry crane.

In addition to convenience and flexibility in switching containers at will from rail or lorry transport to shipboard, the technique gives the shipper the benefit of reduced pilferage, damage and contamination of the cargo. The use of bulk containers began in the summer of 1958, with the loading of the aluminium boxes on to the open decks of existing freighters. During 1959, six of the company's C-3 type freighters carried 75 containers each on their decks between the West Coast ports of San Francisco and Los Angeles, and Hawaii.

Now the *Hawaiian Citizen* has become the first Matson vessel to be converted to all-container operation, and the first of its kind in the Pacific. In the shipyards of the Willamette Iron and Steel Company, at Portland, Oregon, the vessel was stripped of its masts, king-posts, resistor house, winches and other conventional cargo-handling equipment. In its new guise, it looks more like an ore boat than a freighter.

To provide more space, the midship house was cut away from the deck and raised 9 ft., aligning it with a new upper deck erected above the original weather deck. In addition to containers, the *Hawaiian Citizen* will carry liquid cargo in tanks built into the side, while her bottom tanks will be used for fuel oil and water ballast.

Extension Cables

The 72 refrigerated containers, each with a self-contained flush-mounted refrigeration unit operated by electric power, have extension cables that can be plugged into power outlets ashore, aboard ship or in transit over the highway. The units were specially designed for the Hawaiian trade.

Automation is used extensively in connexion with the container operation. Thus, the dockside gantry cranes at Alameda (outside San Francisco), Los Angeles and Honolulu, are electrically controlled from a three-panel console in the cab. A glance at the panel enables the operator to see at once which cells in the hold are still empty, and he can direct containers into these by means of self-synchronizing devices, without being able to see them.

Constant Supervision

On board ship, the refrigeration containers can be constantly supervised by an electrical control panel in the engine room. On this panel each container is represented by three lights, red, green and white. By glancing at these, the ship's engineer can see whether any container is at the pre-set temperature, whether the refrigeration unit is cooling, or if it is in the defrost cycle. This kind of continuous inspection is expected to result in improved care of perishable cargoes.

The coming into service of the converted *Hawaiian Citizen* greatly increases the container facilities offered by Matson Navigation. But, with demand potentially still greater, the company is planning to expand its service further. In March of this year, Matson picked up an option to purchase two bulk carriers, originally built as C-4-type freighters, for dual use as bulk sugar and container service carriers between the U.S. West Coast and Hawaii. Renamed the s.s. *Californian* and s.s. *Hawaiian*, each will be made over to carry 180 of the 24-ft. containers on its weather decks and another 10 in its hold.

With these two ships, Matson's cargo fleet will number 26 vessels. Between them, they will be able to carry some 1,500 dry cargo and refrigerated bulk containers.

Illustrated is the chill tray which the plastics division of Universal Metal Products Ltd. (U.M.P.). of Salford, Lancs, are moulding from white high-impact polystyrene for Kelvinator Ltd. The name "Kelvinator" and the decorative strip are in raised characters on the face of the moulding, and the colouring of the name, which is in black, and of the horizontal bands on either side of it, which are in turquoise, is achieved by the hot foil stamping technique. The decoration is afterwards given a protective covering of transparent lacquer. This chill tray is placed below the frozen food chest on all the new Kelvinator refrigerators with the exception of the K.46MT, and is used for chilling meats and fish. It also acts as a drip tray during defrosting.

Comfort Requirements

for the Human Body

IN a paper recently read before the Institution of Heating and Ventilating Engineers, entitled "Heating Requirements and Heating Effects" P. A. Coles, M.A., said that many learned papers had been written on the requirements for human comfort and it is certainly acknowledged by all that air temperature at the "breathing level" of 5 ft., or at any other level, is not the sole criterion of comfort.

The eupatheoscope, a research tool designed so that it exchanges heat with its surroundings in the same way as a clothed human body, has been used to arrive at "Equivalent Temperature." The equivalent temperature of an environment is defined as the temperature of a uniform enclosure in which, in still air, a black body of sufficient size would lose heat at the same rate as in the environment, the surface temperature of the body being one-third of the way between the temperature of the enclosure and 100° F.

The eupatheoscope is not suitable for use in the field, but an approximation to equivalent temperature in calm surroundings can be arrived at using a sling thermometer, to measure air temperatures, and a globe thermometer. The *I.H.V.E. Guide*, page 97, reproduces figures by Dr. T. Bedford giving this relation. For air and globe thermometer temperatures between 64° F. and 70° F., the equivalent temperature lies 1.25° to 3° F. below the globe thermometer temperature, but between 3° F. above and 7.25° F. below air temperature. Thus the globe thermometer gives quite a close indication of changes of equivalent temperature, but the air temperature may vary quite widely.

Insulation

Most specified or recommended temperatures, including those in the *I.H.V.E. Guide*, are set down in terms of air temperature. While this may be quite close to globe thermometer temperature in multi-story buildings with not too much glass, it can be appreciably higher in poorly insulated buildings, and lower in well-insulated buildings heated primarily by radiation.

Thus putting into a building the amount of heat required to maintain the recommended air temperature, as calculated by the normal method, does not necessarily ensure that comfortable conditions will ensue. This is particularly true for poorly insulated buildings, heated by convection, and it has come to be acknowledged that, in such buildings, systems using a high proportion of radiation had a greater "heating effect" than convection systems, i.e. they provided equal comfort with less heat or greater comfort with the same heat input.

A further factor in the same category is that of temperature gradient. The theoretical heat requirements are calculated on the assumption that the design internal air temperature occurs uniformly throughout the heated space. When a temperature gradient is present, the temperature under the roof and within the upper part of the walls will be higher than the design temperature, whereas that in the lower part, normally the occupied portion, will be less. In order to bring the temperature of this lower part up to the design temperature, more heat input is necessary. This is catered for by a height allowance.

It follows that a system which results in a lower temperature gradient is more effective for a given thermal input.

ROSS GROUP LIMITED

Annual Report

IN his annual report with the accounts for 1959 of the Ross Group, Ltd., the chairman, Mr. J. Carl Ross, makes reference to the subsidiary Jackstone Froster Ltd.: "Sales have been comparable with those of the previous year and have included an order from one of the leading pet food manufacturers for 7 × 18 station "Jackstone" multiple frosters which constitutes one of the largest plate freezing installations in the U.K. Our overseas orders included one from Hong Kong, thus adding yet another name to the already long list of places to which "Jackstone" freezing machines are being exported. A development of major importance has been the introduction, after extensive tests under working conditions, of special steel telescopic rotary connexions through which the refrigerant is conveyed to and from the freezing plates. These connexions have outstanding advantages and we have taken out patents in most countries throughout the world."

Net profit of the Ross Group after taxation is £276,915. The proposed final dividend is 6 per cent. less tax on the ordinary capital recently increased to £1,921,674, making a total of 18% compared with 15% last year.

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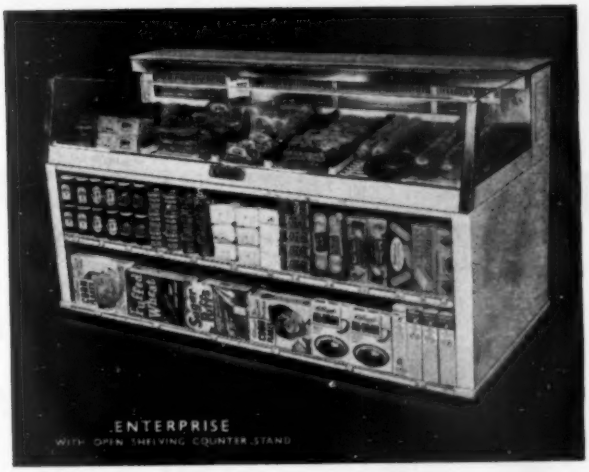

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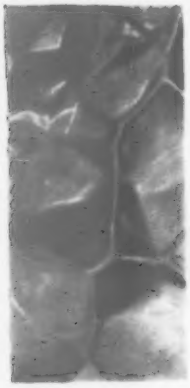

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High Precision Thermometry

DEVELOPMENTS IN THE U.S.

THE U.S. National Bureau of Standards is currently expanding its low-temperature research programme in an attempt to provide higher-precision thermometry in the range from 90° down to 20°K (−183° to 253° C.), and to provide a calibration service for secondary thermometers from 20° down to 2°K. The measurement of low temperatures is growing in importance because of recent advances in cryogenic techniques, and because chemists need a practical and reliable working scale when they determine specific heats, thermal conductivities, and other fundamental properties of materials at these temperatures.

Although there is no international agreement on a practical temperature scale below 90°K, a gas thermometer may be used to make measurements on the thermodynamic temperature scale in this region. The inherent difficulties of this thermometer, however, make it impractical for use in a regular calibration service.

When stable platinum resistance thermometers were developed to operate in this range some years ago, the Bureau was able to establish a provisional scale from 90° down to 11°K. These thermometers are so stable that after 15 years of use, they have been found unchanged within the accuracy of their original calibrations. The provisional scale is based on a group of six of these thermometers, each of which was calibrated with reference to a helium gas thermometer. The use of several thermometers to maintain the scale serves to show whether one of the standards has deteriorated. In the present calibration service from 11° to 90°K, resistance thermometers are compared (at 16 or more temperatures) with two of the Bureau's standards. This makes available a temperature scale which is believed to agree with the thermodynamic scale to an accuracy of 0.02°K.

Preliminary Research

In preliminary research toward making absolute temperature determinations from 20° down to 2°K, the Bureau studied changes in the velocity of sound in helium gas as a function of temperature in the region of 4.2°K. An acoustical interferometer was used for the first velocity measurements, and temperatures derived from the velocity of sound were compared with the temperatures associated with the vapour pressure of the liquid helium bath surrounding the instrument. Although the results were encouraging, there was a need to know more about measuring helium vapour pressure and its association with liquid helium bath temperatures.

Recent Bureau investigations show that a nearly constant-temperature liquid helium bath can be achieved and associated with an extremely reproducible vapour pressure. The bath consists of a few litres of liquid helium in an ordinary metallic liquid-helium storage dewar of 15 or 20 litres capacity. The vapour pressure of the liquid is controlled very accurately and liquid helium evaporates at a rate of approximately 300 c.c. per day. This technique will be of considerable help in determining the accuracy of temperatures derived from sound velocity measurements, because a better comparison will be possible between temperatures derived from vapour pressure and those derived from sound velocity.

When used in the constant-temperature liquid helium bath, carbon resistors displayed remarkable reproducibility of electrical resistance (resistance equivalent to temperatures ranging from a millidegree to a few tenths of a millidegree) versus helium vapour pressure in the range of from 2° to 4°K, even when the resistors had been cycled between 300° and 4°K. Several sources indicate that germanium resistors also exhibit excellent reproducibilities. Thus, both carbon and germanium resistors appear to be promising sources of secondary thermometers for use at low temperatures.

Information and techniques that are gained from helium vapour pressure investigations will be applied toward determining vapour pressures of other liquids at higher temperatures, thus improving current knowledge of their relationships with temperatures. Also included in the low-temperature programme will be studies of transitions in pure substances. It is expected that these studies will make possible a choice of accurately determined transition temperatures to serve as fixed points for calibrating thermometers, and to provide a basis for agreement on an international temperature scale below 90°K.

Onazote For Rail Transport

A booklet describing the ways in which Onazote expanded rubber insulation is applied to rail transport has recently been issued by the Expanded Rubber Company Limited, Mitcham Road, Croydon, Surrey. The booklet explains the properties of the well-known material, and, after a 13-language introduction, illustrates its applications.

New Companies

The accompanying particulars of New Companies recently registered are taken from the Daily Register compiled by Messrs. Jordan and Sons Ltd.

R. T. Harris & Son (Electrical Contractors) Ltd., 16, St. Clements Street, Oxford. Secretary : Jessie A. Harris. To take over business of electrical and refrigeration engineer, carried on at Oxford by R. T. Harris, etc. Nominal capital : £3,000. Permanent directors : Robert T. Harris (Chairman) and Jessie A. Harris, 31, Lyndworth Close, Headington, Oxford.

N. F. Refrigeration Ltd., 34, Yarmouth Road, Thorpe St. Andrew, Norfolk. Secretary : C. G. Dunkley. Nominal capital : £1,000. Directors : Cyril G. Dunkley, 31, Le Strange Close, Norwich ; Derek R. Allman 80 Skelton Road, Norwich.

Hetex (London) Ltd., Martins Bank Building, Water Street, Liverpool. Secretary : William E. Capper. To carry on the business of heating, ventilating and refrigeration engineers and manufacturers etc. Nominal capital : £2,500. Directors : Richard H. Parker, 1, Delamere Road, Arnsdale, Lancs ; George C. Fearnley, 64, Westbourne Road, Birkdale, Lancs. Solicitors : Bartley Cocks & Bird, Liverpool, 2.

Durable Insulation & Acoustic Co. Ltd., River Road, Barking, Essex. Nominal capital : £10,000. Directors : to be appointed by the subscribers. Subscribers : Stanley E. Renshaw & Frank H. Coxhead, 23-5, Eastcheap, E.C.3. Solicitors : Shindler & Co., E.C.3.

Swift Butler Refrigeration Ltd., 126, Grosvenor Crescent, Hillingdon. Secretary : D. Wilson. To carry on business of refrigeration engineers, etc. Nominal capital : £100. Directors: Normand F. Swift, 126, Grosvenor Crescent, Hillingdon ; Robert S. Butler, 9, Coleridge Court, W.14 ; Donald Wilson.

Waingill Products Ltd., 50, Highland Road, Southsea. Secretary : V. C. Wain. To carry on business of manufacturers of and dealers in refrigerators, etc. Nominal capital : £1,000. Directors : Victor C. Wain, 25 Queens Crescent, Stubbington ; Anthony J. Gillespie, 53, Dunbar Road, Portsmouth.

Strong, Rawle & Strong, Ltd. To acquire the whole or part of the business and assets of Strong, Rawle and Strong (Holdings) Ltd., and to carry on business of importers, exporters, refrigerators, shipowners, shipbuilders and charterers of ships ; sheep farmers, stock owners and breeders, meat salesmen, etc. Nominal capital : £30,000 in £1 shares. Directors : to be appointed by subscribers. Subscribers : Ian D. Metherell (solicitor) and Robert Smith (clerk), 9-12 Cheapside, E. C. 2. Registered by Solicitors : Allen and Overy, E.C.2.

Dilwill Refrigeration Equipment Co. Ltd., 128-134, Baker Street, W.1. Secretary : B. M. Igra. Nominal capital : £5,000. Directors : to be appointed by subscribers. Subscribers : Bernard M. Igra (acct.) and Henry I. Jacobs (acct.), 128-134 Baker Street, W.1.

Clifford Farrow Refrigeration Ltd. 210 Tooting High Street, S.W.17. Secretary : D. T. U. Farrow. To carry on business of manufacturers of and dealers in refrigerators, ice cream machines, etc. Nominal capital : £1000. Directors : Derek T. V. Farrow, 48, Merrylands Road, Great Bookham, Surrey; Frederick G. W. Robson, 52, The Dingle, West Green, Crawley, Sussex. Solicitors : A. R. Drummond & Co., Epsom.

S. B. (Insulation) Ltd., 1,281, Stratford Road, Hall Green, Birmingham, 28. Secretary : Philip D. Pearson. Nominal capital : £2,000. Directors : John Denby, 1, Homer Road, Solihull ; John G. Denby, Flat 8, Linden Court, Hampton Lane, Solihull ; Peter Sharp and Eric W. Luckham.

Frank Ewington Ltd. 2, Windsor Court, High Street, Rugby. Secretary : Phyllis G. Ewington. To carry on business of manufacturers of and dealers in washing machines, refrigerators, vacuum cleaners, etc. Nominal capital : £1,000. Directors : Frank Ewington and Phyllis G. Ewington, 63, Faraday Road, Rugby.

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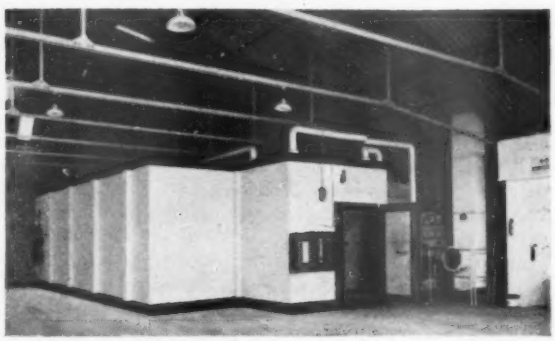

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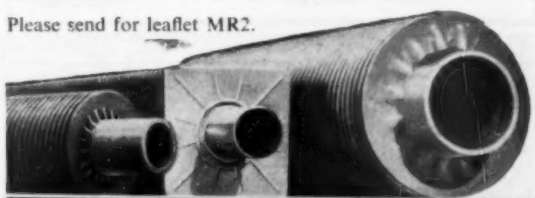

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Air-Conditioning in Industry

To most people air-conditioning means simply the provision of comfortable temperature conditions in which human beings can live, work, play or enjoy themselves. This is, of course, quite true but it represents only a small part of a vast field of activity which is concerned with controlled atmospheres. This article is based on one with the same title which appeared in the January-February-March issue of " Frigidaire News," to whose editor we are indebted.

THE term " air-conditioning," which to many people merely suggests the provision of comfortable temperature conditions, applies in its widest sense not only to the adjustment of temperature but also to the control of air movement, the adjustment of moisture content and the removal of odours and impurities. Sometimes all these factors have to be considered, although in many instances, only one or two of the variables have to be closely controlled. It will be appreciated that to do this job properly the air-conditioning engineer needs to have practical experience in addition to technical knowledge covering a wide range of subjects.

There is an enormous demand for air-conditioning in industry to-day, for people are becoming more and more conscious that close tolerances and accuracy can only be obtained if operations are carried out in a controlled atmosphere. In some cases too an industrial building can be unsuitable for human occupation due to some structural peculiarity, and again this means that air-conditioning has to be introduced in order that the building can be used.

Walker Bros. (Elec. Engrs.) Ltd., the Frigidaire Distributors in Birmingham, in recently installing equipment for the Cincinnatti Milling Machine Co. have demonstrated very effectively how air-conditioning can be used to advantage in both these aspects; that is to assist in obtaining precise measurements and to render a difficult building suitable for human occupation.

Standards Room

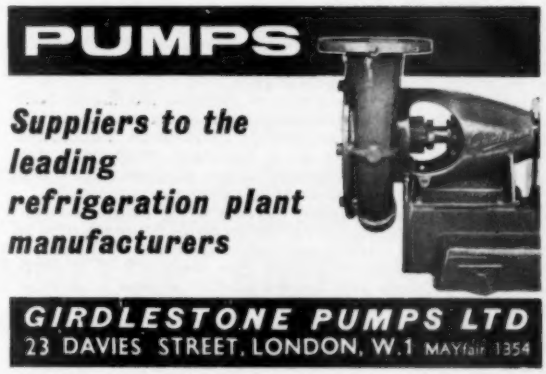
In the first place the Cincinnatti Milling Machine Company have a world wide reputation for precision machine tools for the engineering trade and they must work, therefore, to very close limits and use very high standards in order to get these close limits. A room on their main factory floor has been constructed of lightly insulated metal panels and glass windows. This panelling encloses a dust-free space in which the standards and fine measuring instruments are kept. In addition, there are machines of their own manufacture which have to be held to extremely close limits and in order to ensure that these limits are maintained at all times the components of a grinding head are machined in the area which is maintained at 68° F. (+ or −2° F.) with a humidity below 50%. This low humidity ensures that when the operators are handling the instruments or the machine tools, the moisture on their fingers does not leave marks on the polished surfaces.

The conditions in this room are created by plant incorporating a Frigidaire WD6BS-500 condensing unit which operates in conjunction with a direct expansion evaporator, in front of which is an electric heater rated at 12 kW. The conditions are controlled automatically by means of a motorized modulating step controller.

At the same time a certain amount of filtered fresh air is brought into the room which is maintained at a slight pressure in order to keep out dust from the machine shop floor.

" Hollerith " Punched Card Equipment Room

In addition to the above, another problem involving air-conditioning has been very satisfactorily solved in the basement of the same building. Here the problem concerned working conditions, for due to this section of the plant being built alongside a section of the Grand Union Canal, the basement is in fact below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water level and, therefore, naturally cool and windowless.

When it was decided to introduce the Hollerith Punched Card System and to house the equipment in the basement, it was obvious that conditions would have to controlled so that people could work in comfort in this area. In addition, of course, the system itself must be operated under controlled conditions in order that the cards register correctly and remain flat at all times. Furthermore, the humidity has to be sufficiently low to prevent stray electric currents from tracking across the cards.

Here then were two sets of conditions to be taken into consideration : (1) to provide clean air of the correct freshness and at the right temperature for the operators, (2) air at the right temperature and humidity to ensure that the automatic machines which handle the cards operate correctly. These machines also generate a large quantity of heat and this had to be taken into consideration to ensure that the temperature in the room did not rise above a certain limit.

With Special Reference to the

Bulletin of the International Institute of Refrigeration, No. 1 1960

Reviewed by DR. EZER GRIFFITHS, *Hon. President of the I.I.F.*

IN the announcements of recent meetings we note that the proceedings of the first Argentine Congress of Refrigeration held in Buenos-Aires in May, 1959, are now available. Among the great number of papers read there were some of international interest.

Various institutions supply information as to their research programmes. The Institut de Basses Températures et de Physique Appliquée Laboratoire Cryogénique Louvain gives a list of 10 items many of which are in the domain of pure physics or relating to insulating materials. The National Research Council, Ottawa, has an Applied Biology Division which studies refrigerated transport by road, storage, food freezing and the freezing of biological materials.

Two institutions in France supply information as to their programmes, one at Bellevue and the other at Antony. A new refrigeration laboratory has been established in Delft, Holland, with the object of training engineers and to contribute to the development of refrigeration.

Dealing with the abstracts ; those on basic physics contain one describing a spear type resistance thermometer and an electrolytic hygrometer for the continuous measurement of very low water content of gases.

Under thermodynamics there is an abstract dealing with similarity criteria of the thermodynamic properties of refrigerants. It shows how the most important properties of unknown substances can be determined with the aid of only two experimental values.

Heat transfer in plate heat exchangers is the subject of a theoretical study.

There is an abstract of a paper on automatic operation of centrifugal machines. The original paper has 14 illustrations. Basic data for " Freon-22 " and the design of a two-stage machine capable of operating down to -80° C. constitutes the subject matter of one of the abstracts.

A review of all refrigerants commercially used as well as those in the development state is given, and one abstract discusses the use of fertilizer grade ammonia instead of the refrigerator grade. The conclusion is that the drop in efficiency and damage to plant will offset any financial gain.

There is an interesting group of abstracts relating to such topics as valve design, piston cylinder clearance, measuring instruments for testing compressor components, radioactive determination of bearing wear, two-stage compressors for ammonia plants, calculation and design of single-stage turbo compressors, and application of helical-screw compressors.

An abstract of a paper from the *Proc. of the Queensland Soc. of Sugar Cane Technologists* on the theory of cooling towers is included, and the cooling and dehumidification of air in air washers is the subject of a paper from the U.S.S.R. A Norwegian paper deals with the design of " Freon-12 " fin-type air coolers and defrosting systems for them.

Under insulation there is a paper on methods of insulating vessels for the transport and storage of liquefied gases.

The production of domestic refrigerators in Denmark and Hungary are the subjects of two abstracts, whilst modern testing methods of sealed domestic units are dealt with in the abstract of a lecture delivered in Australia.

A number of abstracts relate to cold rooms : insulation tests, optimum insulation thickness, cold losses due to intermediate floors in contact with the outside enclosure.

Air-conditioning is dealt with in a number of abstracts one of which describes a very accurate air-conditioner giving constant temperatures within a fifth of a degree Centigrade and relative humidity within 1 per cent. Refrigerated transport by rail is dealt with in two abstracts one entitled " Dependable Diesel Power for Mechanical Refrigerator Cars " and the other " New Developments in the Construction of Refrigerated Trains." Several relate to refrigerated transport by water.

A lengthy paper from the U.S.A. Marketing Research Division deals with shipping containers for frozen tom turkeys, and civil engineering progress is dealt with by abstracts on the use of polythene pipes for shaft sinking, and refrigeration in the construction of dams.

Abstracts dealing with meat and offals include such topics as " Water-Binding Capacity and Drip Formation in Meat," " Use of Coating Materials or Film Impregnated with Chlortetracycline to Enhance Colour and Storage Life of Fresh Beef," "Production of Calcium Alginate Films and their Utilization in the Freezing of Meat," " Effects of Wraps on Frozen Beef," and " Liquid Freezing. Its successful application." The 19th instalment of a series of papers on " Time-Temperature Tolerance of Frozen Foods " is entitled " Ready-to-Cook Cut-up Chicken."

Dairy products are dealt with at some length, one paper being entitled " Fresh Frozen Milk " and another " On Storage Conditions for Cheese in Cold Stores."

A paper of 41 pages in English deals with the MKSA Unit System. The information is supplied in the form of 20 data sheets and diagrams.

" The *Bulletin* concludes with the publication of the full texts of two original studies, abridged texts of which were presented at the 10th International Congress. One is entitled " The Effect of Conduction Heat Flow in Gaseous Phase on the Insulating Capacity of Insulated, Refrigerated and Mechanically Refrigerated Vehicles ; Methods Recommended for Texts," by V. Ibl, vice-president of Commission 2. The second is entitled " An Original Analogger for Resolving Refrigerated Transport Problems, by Richard and Lechien. Both are in French.

Among the books received in the Institute's library we note : from Moscow—" Insulated Railway-Cars and Refrigerated Trains," and the " Repairing of Household Refrigerators " ; from France—an " English-French Chemical Dictionary," and " Construction of Industrial Research Laboratories " ; from Germany—" Handbook of Heating, Ventilation and Air-Conditioning," and " Heat Theory, Technique and Use."

The *Bulletin* carries many pages of advertisements and it is to be hoped that still greater use will be made of it by the manufacturers of refrigerating equipment to make known their products.

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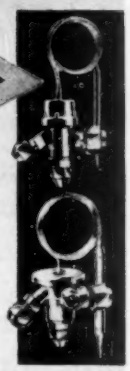

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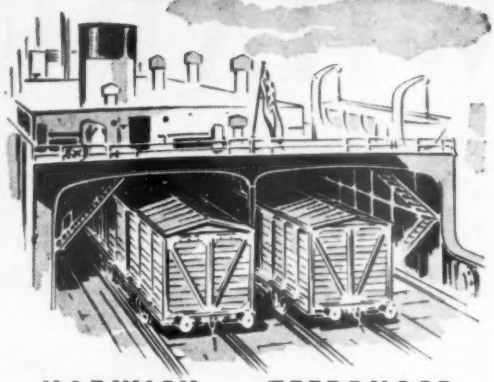

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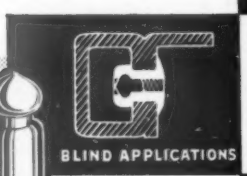

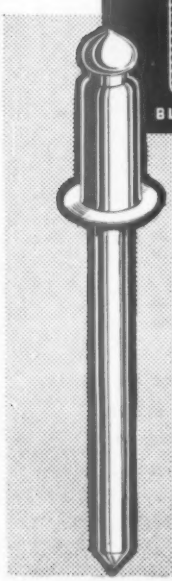

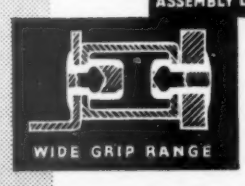

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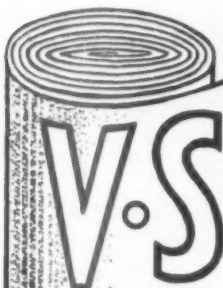

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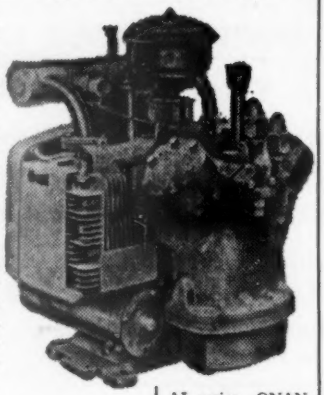

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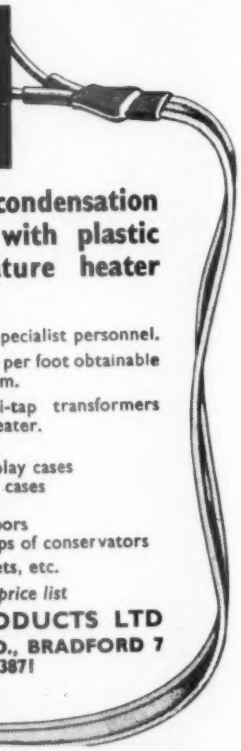

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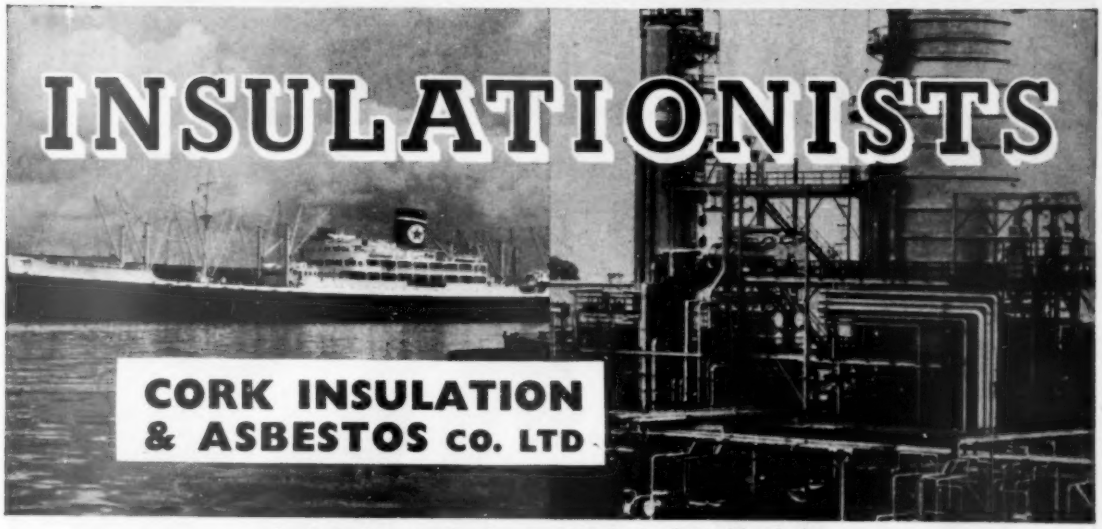

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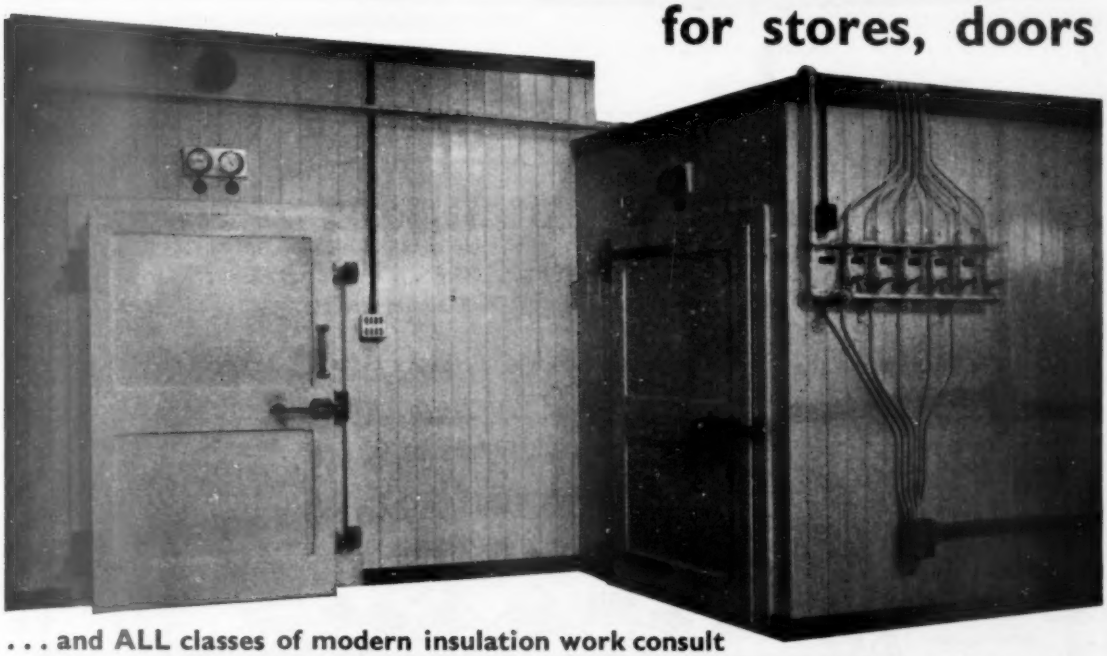

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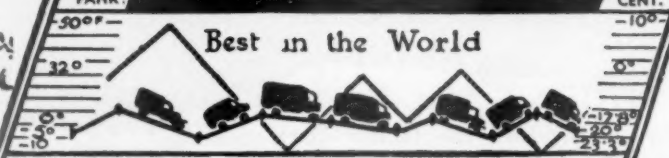

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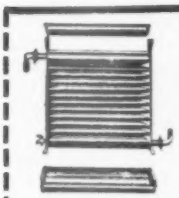

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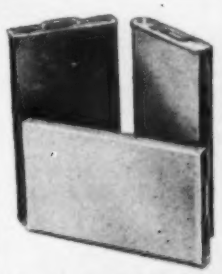

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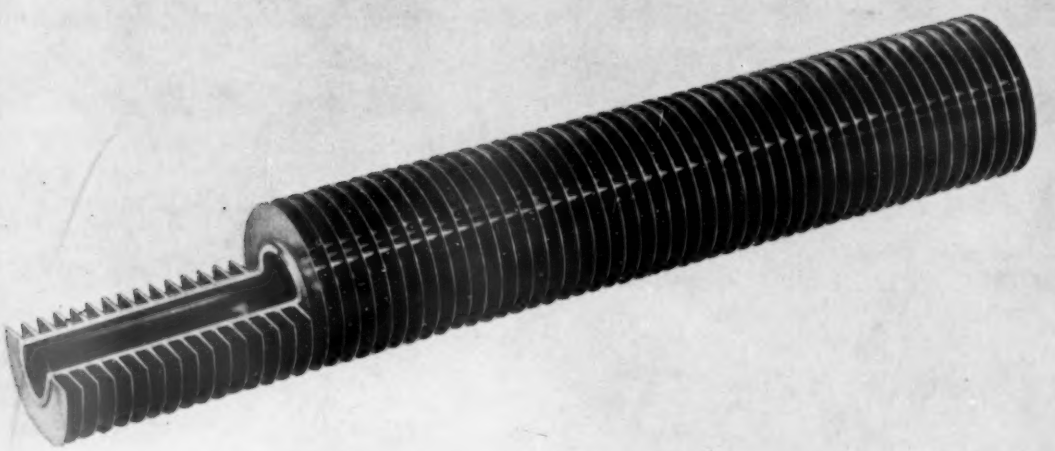

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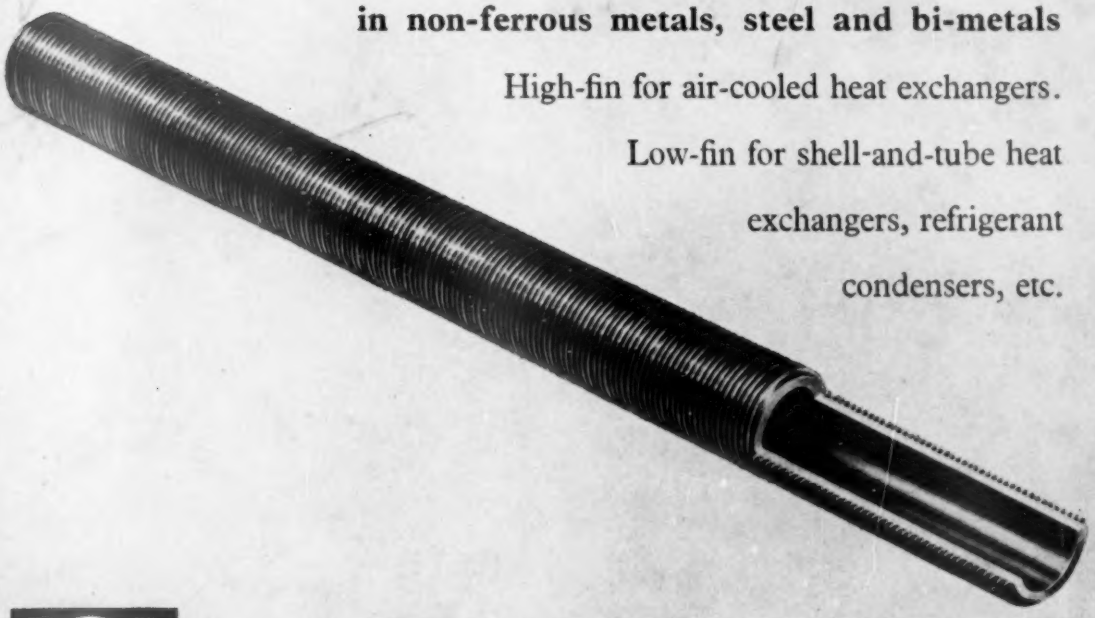

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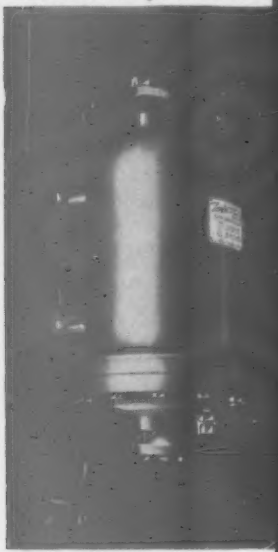

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